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The AUTOMOBILE

French Plants Make V Motors

War Proves Star Type Aero Engines Useless—Eights and Twelves of Automobile Design Replace Freaks—May Affect European Car Practice

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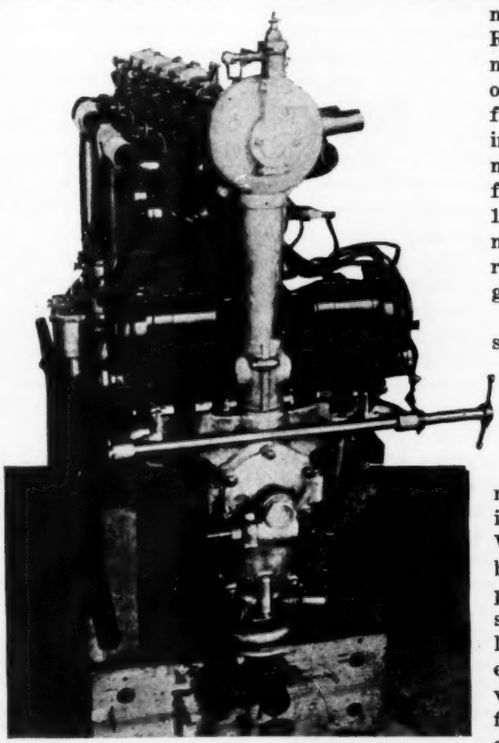
ONE of the many unexpected results of the war has been that automobile manufacturers have become aeroplane engine makers. One of the after-results will be the greater development of the six-, eight- and twelve-cylinder automobile. This is explained by the fact that all the new motors for aeroplanes are of the fixed cylinder, water-cooled type, and although specially made for service in the air, are of the same general design as the motors used in a car. The end of the war will see the French manufacturers with much of experience on multi-cylinder engines directly applicable to their car work.

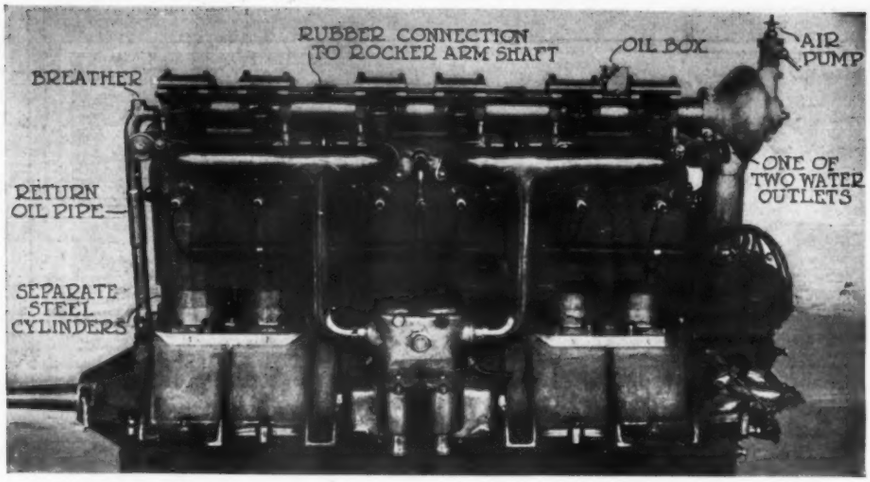
Renault is building sixes, eights and twelves; Lorraine-Dietrich is producing sixes and twelves; Hispano-Suiza has an all-aluminum eight-cylinder motor; Darracq is supplying a successful piston valve six, and an overhead-valve six; Peugeot is interested in an overhead-valve eight; Engineer Henry, late of Peugeot racing department, is supplying the army with a twin four of the same general design as his famous racing motors; Panhard is interested in sixes and eights; De Dion Bouton specializes in eights; Sunbeam is delivering twelves to both the British and the French armies.

There has been a revolution in the French aeroplane motor world since August, 1914. When the armies went forth to war, France had staked her reputation on rotary, air-cooled motors, or motors of the star type, most of them air-cooled. The only largely used motor which at all approximated the automobile type was the Renault eight-cylinder air-cooled model. When France was delirious over flying every automobile manufacturer in the Republic set his drawing office staff to work on aeroplane motors, and every factory produced a few engines for air service. But in 1909 the Gnome rotary air-cooled motor came into the field, and by reason of its low weight, secured a great advantage over all rivals.



End view Mercedes aviation motor, showing vertical shaft operating water pump, revolution counter, two magnetos, camshaft and gasoline pressure pump located on top of housing

At that time flying was merely a sporting proposition, and flights were of comparatively short duration. Under these conditions the Gnome, despite its inherent defects, gave better results than any fixed cylinder water-cooled motor, and was not long in obtaining a predominating position in the aeronautical world. When interest in the sport of flying began to wane, and when the aeroplane became a purely military instrument, the French manufacturers lost interest in their aeroplane motor experiments, and individual inventors turned their energies to other fields. In France alone between 100 and 150 different makes of aeroplane motors were designed and built between 1908 and 1912. It would be quicker to give the names of the fac-



Carbureter side Mercedes six-cylinder aviation motor, showing features of design

tories which have not dabbled in aviation than to quote those having produced and abandoned a special aero engine.

For several years aeroplane and automobile engine development has been on entirely different lines. The men who built for the air took no interest in engines for the road; and, with the single exception of Renault, no automobile manufacturer had any interest in the aerial business. In consequence, the automobile high-efficiency development of the last four years has had no counterpart in the aerial field.

Testing Aero Types

This was evident to close observers before the war, and has been made apparent to the entire world since the outbreak of hostilities. In 1913 the Automobile Club of France decided on an aeroplane motor competition, the essential condition of which was that the motors should run for 100 hr.—twelve days of 8 hr. each, and one day of 4 hr.—half an hour being allowed each day for starting and minor adjustments, consumption above a certain maximum being penalized by a reduction of the theoretical number of hours run, and consumption below that maximum being compensated by an increase in the calculated hours of operation. Thus of two motors having operated 100 hr., one might have its time increased by reason of gasoline economy, and a second might have its time decreased because of excessive consumption.

No automobile manufacturer entered this competition. The interested parties were aeroplane motor specialists. The eight motors entered comprised Gnome types, fixed cylinder air-cooled, star type motors, and one nine-cylinder water-cooled engine of the star type. Not a single engine actually ran 100 hr. without mechanical trouble. The best was the water-cooled engine, which was in operation for 98 hr., 58 min., 30 sec., the balance of time being lost in changing a magneto distributer. This motor was the only one consuming less than the official allowance of 350 grams gasoline and oil per horsepower-hour, and in consequence was credited with 123 hr. running. No. 1 Gnome type had six stops for mechanical failures, during which pistons, balance weights, and valves were changed and the motor entirely overhauled. It ran 98 hr., but as its fuel consumption was 494 grams per horsepower-hour, its theoretical running time was reduced to a little less than 56 hr. Two other motors from this factory had to be withdrawn owing to mechanical defects. A similar rotary type had five stops on the first day and went out with a cracked cylinder. A second and similar motor averaged four stops for each of the four days it was running.

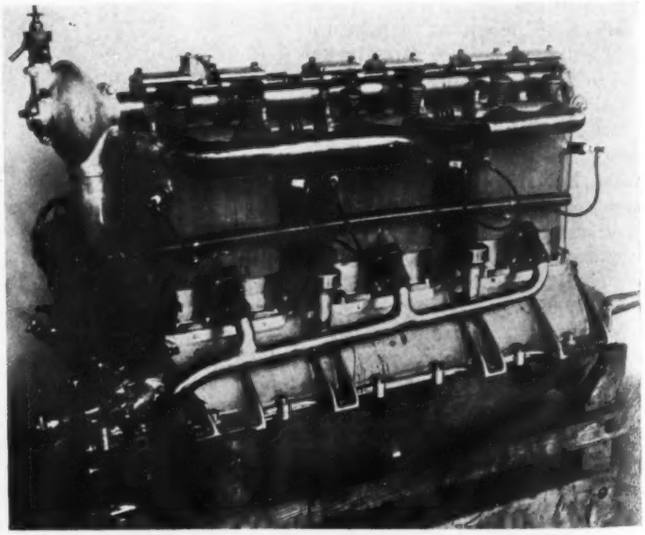
The excessive gasoline and oil consumption of the air-cooled rotaries was really alarming. The Gnome which ran for 98 hr. had an oil consumption practically 30 per cent of its gasoline consumption, while some of the more recent automobile type aviation engines have an oil consumption only 0.057 of the gasoline supply. Ignoring fuel, the Gnome type is undoubtedly the lightest motor in existence. Also on a basis of 5 hr. operation, and with units up to 100 hp. this motor is lighter than any other type. But for higher powers, and for longer non-stop runs the fixed cylinder automobile type is superior.

Considering the Gnome and the nine-cylinder water-cooled motor taking part in this competition, estimating on 60 hp. for one hour, the weight of the Gnome is 249 lb., and of the water-cooled engine 480 lb. With fuel and supplies for 10 hr. running the Gnome weighed 807 lb. and the water-cooled engine 777 lbs. For 100 hr. operation the weights are 6387 for the Gnome and 3747 lb. for the water-cooled rival.

Another comparison, in which the Gnome, the nine-cylinder water-cooled motor and one of the latest eight-cylinder water-cooled engines are compared on the basis of 100 hr. running and the same horsepower developed, works out as follows:

Motor	Lb.
Gnome type	2,841
Nine-cylinder water-cooled aviation motor	2,203
Eight-cylinder water-cooled automobile type	1,366

Up to 100 hp., and for flights not exceeding 4 hr., the Gnome type motor is equal to any other, when considered on a weight basis. Thus it is satisfactory for single-seaters used for observing the effects of artillery fire. The development of long range heavily armored aeroplanes has called for motors of 150 to 250 hp. For this class of aeroplane the rotary is useless. Its high gasoline and particularly its high oil consumption make it one of the heaviest motors in existence. It fails also on the score of reliability, for military statistics, prepared during the first year of war, show that one make of rotary motor averaged 4 hr. useful flying and another 12 hr. effective service, before going to the scrap heap. Inaccessibility is another defect of the rotary, and is largely responsible for the short average life. Under peace conditions skilled mechanics were always in attendance. On war service unskilled hands have to be trusted with these very delicate pieces of mechanism, and succeed in considerably shortening their lives. It is difficult to silence the rotary air-cooled motor, while the fixed-cylinder water-cooled motor

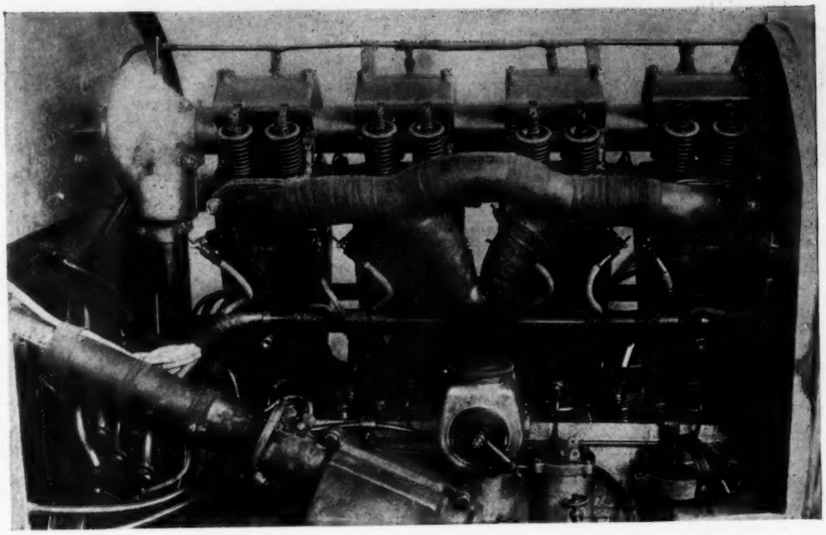


Exhaust side Mercedes aviation six which uses separate steel cylinders but a common waterjacket for each pair

can be silenced as effectively as the engine between the frame members of a car. Now that aeroplanes are built with engines totalling from 500 to 1000 hp., silence is an important feature.

Car Makers Take Responsibility

Very early in the war it was recognized that the rotary type in which France had specialized was not the best kind of engine for active service conditions. Gradually the contracts for this type of engine were reduced until they are now approaching the vanishing point, and at the same time automobile manufacturers were encouraged to build for aviation purposes. At the present time all the automobile factories are busy and the aero-motor specialists are transferring their attention to fixed cylinder types. The elimination of the nine-cylinder water-cooled star-type motor, which was mentioned in connection with the automobile club competition, has been due to the tendency to catch fire in the air. This is a defect almost inherent to this class of design, and is not found in the automobile-type engine. When seven machines were burned in seven days owing to this motor defect, the manufacturer found himself cut off the army lists.



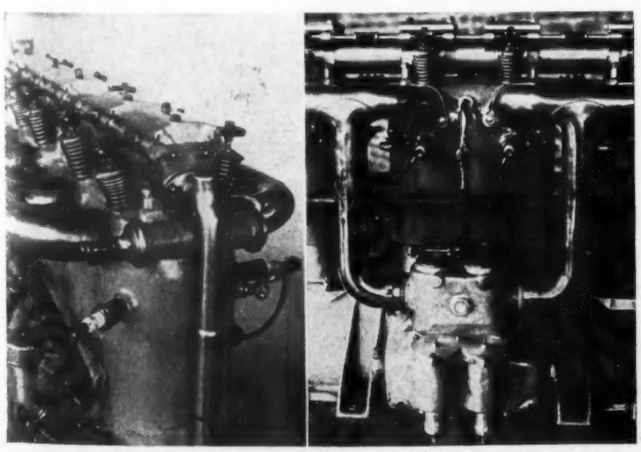
Mercedes racing motor. Compare this with aviation type on opposite page

Effect on Automobile Uncertain

It is not safe to predict a wholesale reversal to sixes, eights and twelves for car purposes, as the result of the experience French automobile manufacturers have acquired in the aviation field. When, after examining his twelve-cylinder water-cooled aviation motor, the remark was made to Louis Renault: "I suppose you will use this type of motor in your cars." Renault replied, "It would be anti-commercial." Despite this reply, there is reason to believe that after the war many of the high-grade cars built in France, and also some in England, will have eight and twelve-cylinders.

Germany's aeroplane motor experience is in striking contrast to that of France. It was not until 1911 or 1912 that Germany began to doubt the efficiency of her Zeppelins and to turn her attention to the creation of an aeroplane fleet. At that time she was dependent on France for her aeroplane motors, and the rotary-type Gnome figured largely in German sporting events. The change was rapid. Under military direction the automobile factories of Germany devoted themselves to the task of producing a strong, reliable, water-cooled fixed-cylinder motor of the automobile type. The government regulations put out of consideration anything in the nature of a copy of the French Gnome, and the automobile factories left to their own resources naturally adapted their automobile experience to aviation work and built engines which had much in common with their standard, or racing design.

The past year has shown that the German military authorities were more far-seeing than those of France, for they adopted a type of motor which has proved satisfactory under war conditions, while, since the war began, France has made a transformation which would have been considered miraculous under ordinary conditions. The war has also shown the thoroughness with which Germany has tackled the aviation motor problem. Benz and Mercedes were the two most interested German factories. Benz produced six-cylinder overhead valve motors, with push rods and rockers, and Mercedes developed a six-cylinder type with overhead valves and overhead camshaft.

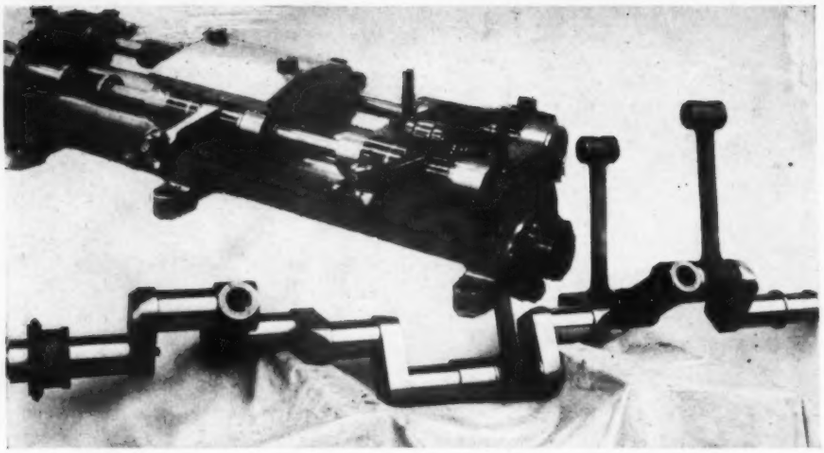


Left—Mercedes overhead camshaft gear. Note overflow oil pipe with breather on top. Right—Detail of Mercedes waterjacketed duplex carbureter

Germany Showed Most Forethought

It is now evident that Mercedes' sudden interest in French automobile racing was due to her anxiety to perfect the aviation type of motor the German army wanted in big quantities. After winning the Grand Prix race in 1908, Mercedes took no interest in French automobile races for a period of five years. In 1913 she refused to be drawn into the French Grand Prix run under limited fuel rules. But in the autumn of that year she suddenly appeared at an open race at Le Mans with a fleet of five cars the existence of which nobody had suspected. The cars arrived late on the course and they went back to Germany the morning after the race. But for the driver of one of the cars shedding his hood while traveling at speed, no foreigner would have obtained a glimpse of the power plants of these cars. It was difficult to find a reason for Mercedes suddenly deciding to participate in a secondary French road race, the winning of which could not have brought much credit, and which was certainly costly. It was finally concluded that the Belgian agent, Pilette was instrumental in getting the cars together, and the matter was forgotten.

It is now clear that the factory itself was decidedly interested in those cars, for they carried the new Mercedes aviation motor, and the race was taken advantage of to subject them to a more searching test than it was possible to give them in the air. Only one of these cars was allowed to leave the German factory. It was purchased by E. C. Patterson of Chicago, and was driven in the 1914 elimination



Above—Overhead camshaft in housing of Mercedes aviation motor with one of rocker arm covers removed, showing rocker. Below—Six-cylinder four-bearing hollow crankshaft used in Mercedes aviation motor. Note size of wristpins, bushings of which are made from good cast iron and are drilled for lubrication

trials at Indianapolis by Ralph De Palma. The car did not start in the race. This motor had been designed for a maximum of 1400 r.p.m. in the air, and when made to approach 2000 on the track periodic vibration developed. This was known to the Mercedes factory before the French race was run, and the necessity of studying balance at high engine speeds was the important lesson learned by the Mercedes engineers.

Last Grand Prix Was Final Test

At the last French Grand Prix at Lyons, run a couple of weeks before the declaration of war, Mercedes again put in a full team of cars. Complete mystery surrounded the motors of these cars. The Mercedes engineers and officials allowed members of the technical press to walk around, crawl under, or crawl over their racing cars, but they allowed nobody to peep under the hood. Precautions against peeping Toms comprised a 10-ft. wall, a watch dog and a night and day watchman, an oak door to the garage, a couple of mechanics sleeping by the side of the cars, and a chain and padlock around each bonnet. Persuasion and cajolery were alike powerless to extract information regarding the motors, and the meager facts finally obtained were mainly secured by strategy. French offers to buy these cars were refused. Only one machine was sold, this being the car with which Ralph De Palma won the Indianapolis race this year.

While these Mercedes motors were specially built for the French Grand Prix, their design was that of the Mercedes aviation engine. It is rather a bitter reflection for the French that only a few days before war was declared, a German firm was making use of French road races to test and perfect military aeroplane motors. It was declared at the time of the race that the German Emperor sent a personal telegram of congratulations to the Mercedes team at Lyons. This is not surprising, now that it is realized the winning of the race was a matter of military importance.

Mercedes motors, which are found on about 80 per cent of German aeroplanes, are considered the best from across the Rhine. Other makes, even when captured in good condition, are not used on French machines. At the suggestion of the French military authorities the Renault and Lorraine-Dietrich factories now build duplicates of the German Mercedes motor and fit them to their own biplanes. Parts built in these French factories are interchangeable with the German motors, so that every machine captured in a reasonably good condition means not only a loss to the enemy, but a gain to the Allies.

Details of Mercedes Motor

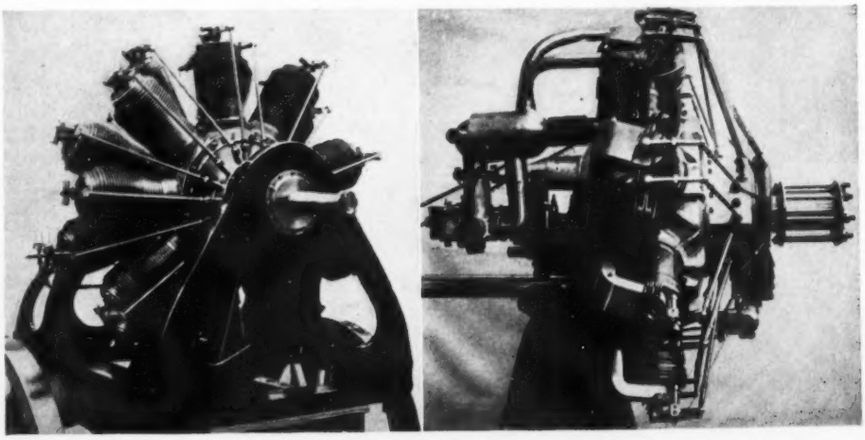
Germany's leading aviation motor is a six-cylinder Mercedes measuring 4.7 by 5.5-in. bore and stroke. As is fairly well known, the cylinders are separate and machined from steel forgings, with inclined valves mounted in the head. The same general design is found throughout the aerial engines and those used for speed work on the road and track. The illustrations of the aeroplane motor give the impression of cylinders cast in pairs. This, however, is not so, the cylinders being separate, as in the case of the four-cylinder racing model, but with a common waterjacket for each pair on the six.

In the last French Grand Prix race at Lyons, Mercedes was alone in the use of separate steel cylinders, every other competitor—French, English, Italian and Swiss—seeking rigidity by means of a compact block casting. The radical difference between the two types of motors led to some discussion at the time as to which school held the balance of advantages; the German partisans maintained that the more careful machining, both inside and out, rendered possible with separate steel cylinders, outweighed whatever rigidity advantages there might be with a block casting as developed by the French and Italian schools.

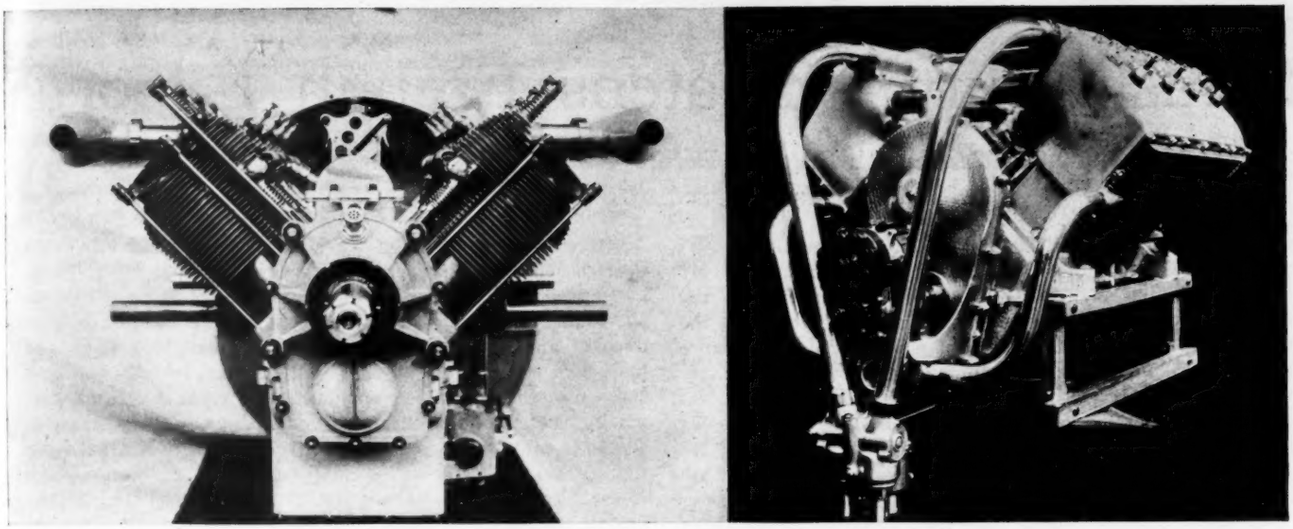
It is now seen that Mercedes had another reason for adopting separate steel cylinders. Her motor had primarily been designed for aeroplane work, in which weight was an important consideration, and road racing was only indulged in to test the design and construction of the aeroplane engine. Her engineers were thus bound to the use of separate steel cylinders.

Cylinders Are Complicated

With a view to weight reduction, cylinder walls are made as thin as possible, but the necessary rigidity is obtained by a series of four circular ribs around the barrel of each cylinder. Valve seats and guides are screwed into the head of the cylinder and then acetylene welded in position. A steel waterjacket is welded to the cylinder or cylinders, there



Left—Eighteen cylinder rotary, Gnome type motor. The war has proved the death knell of this design. Right—Nine-cylinder water-cooled Salmson motor which has a tendency to catch fire



Left—Renault eight-cylinder air-cooled aviation motor with housing removed. Note propeller is mounted on end of camshaft. This is the only successful air-cooled motor in France. Right—Panhard eight-cylinder water-cooled type

being a jacket per cylinder in the racing type and a jacket for two adjacent cylinders in the aeroplane engine. Each cylinder is held to the aluminum crankcase by eight bolts. Despite the apparent external dissimilarity, the cylinder design and construction is identical in the two types of motors.

The aeroplane motor has but two valves per cylinder, whereas on the racing four pair intakes and exhaust are employed. Valve diameter on the six is 2⅛ in., with a valve lift of 5/16 in. It will be observed that the valve area is small compared with the area on this and other makes of racing motors, but it is not desirable that the number of revolutions in the air should exceed 1400.

The crankshaft is a very fine piece of work, entirely hollow, and not merely bored for oil leads, attached to the upper half of the crankcase in four white metal bearings. The diameter of the shaft is 2⅛ in. and the four bearings have a uniform length of 2¾ in. I-section connecting-rods, machined all over and drilled in the webs were used on the original Mercedes motors, but it has been possible to save weight without any loss of strength by the use of hollow circular section connecting-rods. Four bolts are used for each connecting-rod end. Wristpins are hollow, with a diameter of 1 5/16 in. The upper end of the rod carries a cast-iron bushing drilled with a large number of lubrication holes of about 3/16 in. diameter.

At one end of the crankshaft is a bevel pinion driving an inclosed vertical shaft by means of which power is transmitted to all the accessory organs. At the upper end of the shaft a bevel pinion engages with a gear on the end of the overhead camshaft; at the extreme lower end is the water pump; the revolution counter is mounted just below the crankshaft. Just above the crankshaft, and to left and right of the vertical housing, two Bosch high-tension magnetos are mounted and driven by bevel gearing. The current is led to two plugs in each cylinder, mounted horizontally just below the valves. The magnetos are synchronized, the advance and retard mechanism being common to the two units. Mounted on the top of the vertical housing containing the camshaft drive pinion is a gasoline air pump driven by eccentric off the end of the camshaft.

Overhead Camshaft Very Light

The overhead valve mechanism is a very fine example of careful designing and skilled construction. A light steel housing attached to the cylinder heads by means of twelve vertical studs, carries the hollow camshaft, the rocker arms, and their hollow shafts. It has not been possible to get the exact weight, but judging by the feel the entire structure cannot weigh more than 4 or 5 lb. Detailed structure can easily be gathered from the illustrations.

It will be seen that the inner end of each rocker is forked and receives a roller in contact with the face of the cam. The outer end is split and also threaded to receive a stud, the hardened end of which is in contact with the extremity of the valve stem. The stud allows of tappet adjustment and can be locked in its correct position by tightening up the bolt going through the two split ends of the rocker. Very elaborate oiling arrangements are provided. Lubricant is carried up the vertical shaft housing, through the hollow camshaft to the main camshaft bearings and also through the hollow rocker arm shafts to the rocker arm bearings. At the end of the camshaft housing opposite the drive, there is a steel return oil pipe leading into the base chamber, and a breather is mounted on the top of this pipe.

Provision for Splash

Although the rockers are lubricated internally, provision is also made for a supply by splash. On the inner face of the cast aluminum cover mounted on the top of each pair of rockers are two thin aluminum splash guards which cause the oil splashed up by the cams to be thrown into an oil duct in the body of each rocker and from here it flows to the bearings. The rocker arm shafts are common to two rockers, but are joined up by means of oil-resisting rubber connections. This gives two continuous hollow shafts fed with oil flowing by gravity from an oil box on the top of the housing. On the racing model the rocker arm shafts are not hollow, the delivery being entirely by splash, with level maintained by means of hand pump and overhead pipe.

The supply of oil is contained in the base chamber, which has its greatest depth in the center. There are aluminum baffle plates placed horizontally at both front and rear end of the crank chamber to prevent the tilting of the engine in either direction throwing the oil into the end cylinders. The oil pump is in the bottom of the central well and can be withdrawn independently of the crank chamber. Power is transmitted to the oil pump off the vertical shaft by means of a horizontal shaft in the base chamber, and worm gearing.

A duplex Mercedes carbureter is fitted, supplying respectively the three forward and the three rear cylinders. Although the pair are cast together, each carbureter has its own float chamber and its own main and pilot jets; the two throttles are connected and operated together. The carbureter, which is of cast aluminum, is bolted close up to the base chamber and obtains a jacket of water from the central pair of cylinders.

British Duty Threatens French Exports

$11,000,000 Trade with England Before War May Be Rendered Impossible After Peace Is Declared by 33⅓ Per Cent Tariff

PARIS, Sept. 24—When Chancellor of the Exchequer McKenna announced a British import duty of 33 1/3 per cent on all foreign automobiles, the first instinct of the French manufacturer was to utter a cry of despair. In the last year for which complete figures are available, France exported automobiles to the value of $43,500,000; of this amount $11,000,000 represented trade with England. A 33 1/3 per cent duty is prohibitive. There is not a French manufacturer who could stand up under it. The best equipped firms would seek to minimize the duty by shipping bare chassis without tires, wheels, magnetos, carbureters, etc., finishing the machines in England, and would make arrangements for the establishment of erecting and body shops. For the bulk of the French trade the British market would be completely closed. There are at least fifteen factories in France sending from 40 to 65 per cent of their output into England. For these the conditions looked hopeless.

Since the announcement the situation has been examined more calmly, and the dominant feeling is that the tariff is a war measure to be repealed as soon as peace has been declared. It ought to be explained that it is more a hope than a belief that England will abolish the tax after the war. No official announcement has been made by the English authorities, and until the newspaper publication of the budget proposals the leaders of the French automobile industry had no idea of a British tax on foreign cars.

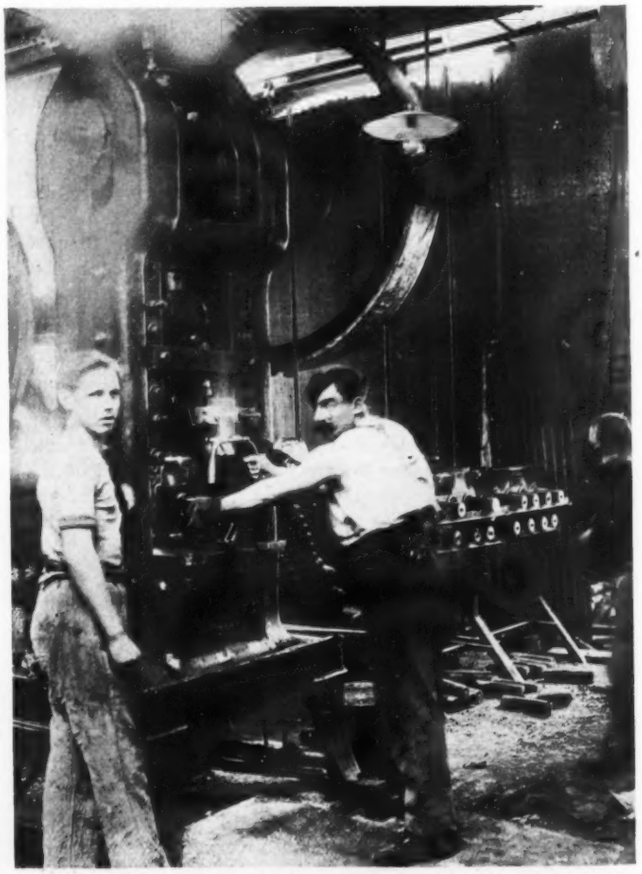
The belief is expressed that the import duties have been adopted as a protection against America, and that later preferential treatment will be given to France and her Allies. As the French automobile factories are able to export but a minute number of cars, the tax does not at present seriously touch this country. With wonderful unanimity the French manufacturers declare that it is inconceivable for England to maintain a tariff barrier against French goods, and particularly against such an important industry as the automobile. Nevertheless, those firms having important interests in England, and particularly those French factories registered under the English limited liability law, will continue to feel very nervous until they have obtained definite assurance that England's action is directed against neutral countries and not against the Allied nations. When ideas have taken concrete form, it is more than likely there will be an understanding between France and England on the matter of tariffs, and that joint action will be taken to prevent America getting hold of the European automobile market in the interval immediately after the war.

Factories Deal Direct

Up to the present France has been apparently indifferent to the danger of American competition, for it is practically impossible to sell any automobiles in that country except to the government. This business, too, must be done direct. The most skilled and persistent intermediaries have been forced out, and all business is now being done direct between the French Government and the American factories, or between the factories and the official banking representatives of the French State. A few enterprising dealers have made arrangements to put American cars on the French market as soon as ever there was a possibility of selling, which means as soon as ever the war was over, but they have not imported or sold any cars up to the present. Among the American firms having entered into arrangements with French dealers are Buick, Overland, Studebaker, Chalmers and Saxon. These dealers recognize that when the war comes to a close it will be impossible to find a new French automobile anywhere in the country, and that no factory will be in a position to produce in any quantities in less than six months. Thus, the man who can deliver at once will certain do business. As the end of the war is not immediately in view, it was not surprising that public attention was not drawn to these preparations for capturing a slice of the French trade. Nevertheless, the authorities have kept a close watch on the situation, and there is every reason to believe that they are prepared to take drastic measures to protect their industry against invasion from any source immediately following the war.

Conditions Different in England

In England conditions are different, for during practically the whole fourteen months of the war there has been a certain private market for foreign cars. It is no exaggeration to say that the British manufacturers are enraged at the possibility of their market being seized by an outsider while they are busy working for the army. Certain manufacturers have led a serious campaign against foreign cars, although the word foreign might best be translated by "American,"



How the French automobile factories are occupied in making war munitions. Stamping a 75-mm. shell. Note the gas furnace heating sixteen shells at the right of the illustration and also pile behind the machine

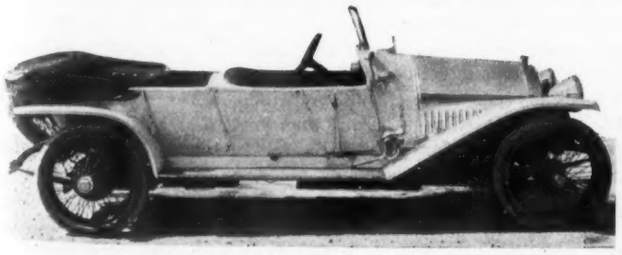
for the only automobiles entering England are those from across the Atlantic. Until only a few days ago, the great majority of the British automobile factories had been requisitioned as a whole by the government and were not in a position to furnish a cent's worth of goods to the private client. Quite recently there has been a slight relaxation and a small portion of the output can go to approved private firms having government contracts and needing automobiles. This applies particularly to trucks. The complaint is not that the factories are losing money, for they are all making as much, if not more than in the most prosperous peace times, but that when the war finished they would find their own market in the hands of the American.

Resentment Against French Factories

The realization that their position was as bad as it possibly could be, tended to raise a little resentment against the French factories, which have never been absolutely forbidden to supply private orders. Dealing with this point, the English manager of a French company declared it was the fault of the Englishmen themselves if their whole business organizations had been seized by the army. "When the threatened march on Paris was averted last September, the entire automobile industry of France was called to a joint meeting with the military authorities. When we were asked if we could make shells, we decided to place the whole of the automobile factories of France at the disposal of the war department. At that time not a single factory was running; most of us did not possess more than 2 per cent of our staffs. Some of our men had already been killed or made prisoners. Nevertheless, within fifteen days we were producing shells. Within a month most of us had as big a payroll as before the war, and since then there has been a steadily progressing output. Where it was possible to do so without interfering with army contracts, we were allowed to fulfill private orders. As we all had a few men not under military obligations, and we all had some raw material in stock, it has been possible throughout the war to produce a small number of private cars. The output is really insignificant compared with peace times, but our initial action saved us from being taken over lock, stock and barrel by the military authorities.

"England unfortunately made the mistake of supposing that the war would be over in six months, or a year at the most, and that the best policy was to 'carry on as usual,' so as to be ready to take advantage of the after-the-war boom. Many British manufacturers declined to accept army contracts, or accepted contracts of an insignificant nature not likely to interfere with their general organization. In consequence there was serious delay in getting the British factories to work on the production of munitions. In several cases it was necessary for the authorities to interfere, militarizing the entire factory, and refusing to allow any private work to be done. The trade realized its mistake at a rather late hour, and is now completely and efficiently organized for helping on the war."

French army automobile drivers carrying out a wayside repair on car damaged by the enemy's guns



A new French model, the 1916 sports type Darracq, which has a four-cylinder 3.3 by 5.5 motor, giving 50 hp. and capable of 65 m.p.h. with four passengers and full equipment

Duty Useless as Protection for British Automobile Manufacturer

LONDON, ENGLAND, Oct. 3—The import duty on American cars has caused no little upheaval in the trade and no doubt will take some little time before it gets back into its normal condition. It is not expected to have a very severe effect on the sale of American cars; the Cadillac being likely to feel it most of all. The Overland people have advanced their price by $250, the Oakland four, $350, the small Oakland six, $225, the Oldsmobile four, $350. I expect the Studebaker four will go up about $325 and the Studebaker six $400.

The American trade have had a large number of meetings and a deputation has waited upon the Chancellor of the Exchequer just to prove to him how ruinous such a tax would be upon the dealers dotted all over the country. There is a distinct feeling that the tax will never be made law, as the amount of money to be collected from it, and also the amount of money that it would prevent going out of the country, is not worth much attention by the government. As a tax to assist British manufacturers, of course it is useless; to do any good it wants to be something like 100 per cent. Probably it will hit the American tire manufacturers very much more than the car people.

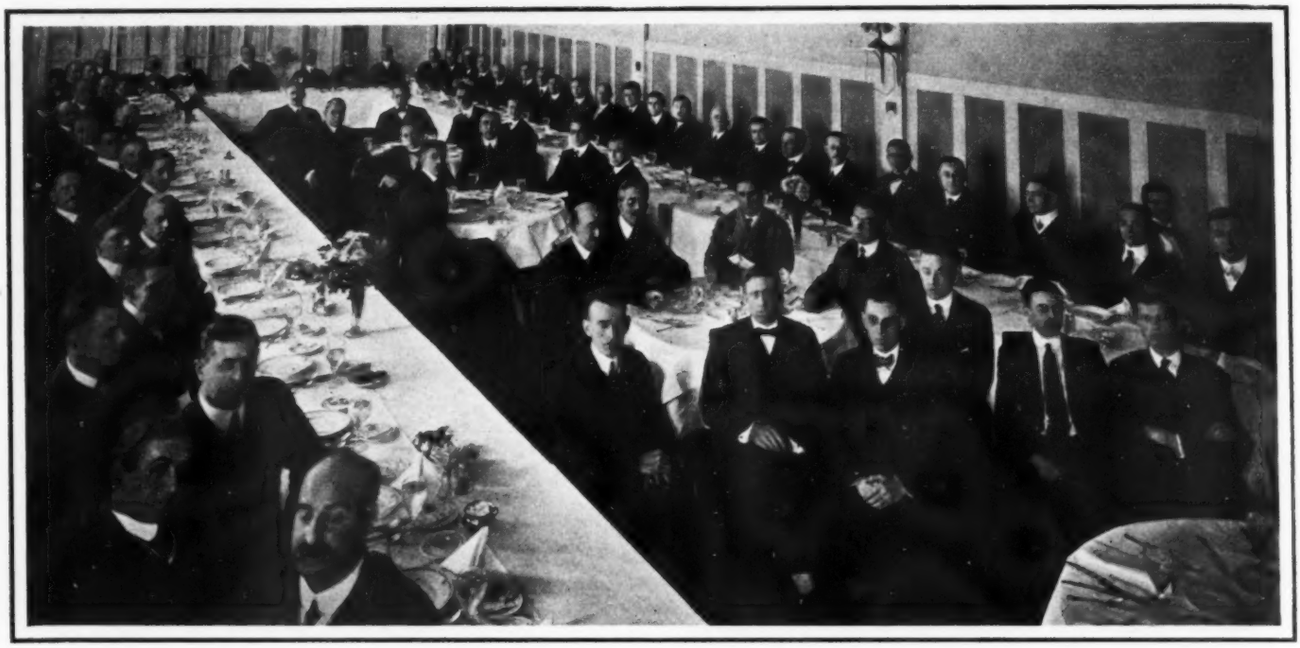
From current advertisements appearing in the English journals it is seen that the government has given some of the commercial vehicle manufacturers a limited release which will enable them to supply vehicles to firms employed upon government work, and it is likely that it will assist the car manufacturers in a similar way.

May Reduce Our Trade with England One-Third

DETROIT, MICH., Oct. 13—George Hutton, representative for Dodge Bros. at Dublin, Ireland, who is at the Dodge plant, in commenting on the new automobile import tax of 33 1/3 per cent just decided upon by Great Britain, said that it will probably cause a reduction of one-third in the importation of American cars, and possibly a greater percentage.

"The new import tax has stirred up a great deal of discussion in England and Ireland and there has been some feeling that it has been directed against the United States. My opinion is that the real purpose was to keep as much money as possible in England. The people generally are living more economically.

"If there was any real passenger car buying in Great Britain now, the reduction in sales would be still greater, but for the past six months we have been selling practically no cars for pleasure only. The people still buying cars are doctors, salesmen, farmers and similar persons.



Banquet of the S. A. E. Standards Committee and Mid-West section held at the Chicago Automobile Club, Thursday evening, Oct. 14

Mid-West S. A. E. Section in Chicago

Many Members from Wisconsin and Indiana—License Brackets and Pump Bases Among a Number of New Standards Ready for Approval of Society—Committee Reports

CHICAGO, ILL., Oct. 15—A Chicago section was added to the family of the Society of Automobile Engineers at the time of the quarterly meeting of the standards committee held here yesterday. In fact, the formation of this section was one of the reasons that the committee held its meeting at Chicago rather than at its Detroit headquarters. The temporary organization took place at a dinner held at the Chicago Automobile Club following the business session of the committee.

For some time, it has been felt that the engineers on the west side of Lake Michigan should get together more often, and a Chicago section has been talked of for more than a year. The name Mid-Western section was adopted, however, as it fits the territory better, than would the name of the city, for it developed at the dinner that the section could draw upon over fifty S. A. E. members in Milwaukee alone to say nothing of those in the other adjacent Wisconsin and Indiana automobile cities.

The work of the temporary organization will be carried through by William H. VanDervoort, president of the S. A. E., as chairman; Mark A. Smith, Standard Oil Co., vice-chairman; Daniel Roesch, Armour Institute, treasurer, and Darwin S. Hatch, *Motor Age*, secretary. As soon as a charter has been granted by the council, the Mid-West section will complete its permanent organization. Indicating the decided interest which is being manifested in the new body was the attendance of seventy-five members at the organization dinner.

Among those who spoke in favor of the Mid-Western section and who gave valuable suggestions to this newest member of the S. A. E. family were David Beecroft of THE AUTOMOBILE, K. W. Zimmerschied, General Motors Co., Herbert L. Connell, Milwaukee Central Continuation School, George W. Dunham and G. H. Conant, chairman and secretary respectively of the Detroit Section S. A. E., W. P. Kennedy, New York City, Prof. P. B. Woodworth, Stevens Institute and Russell Huff.

Iron and Steel Division Reports

On the preceding day several of the divisions of the standards committee held meetings which resulted in reports presented to the committee as a whole yesterday. The first report at the morning session was given by Mr. Zimmerschied and dealt with the work of the iron and steel division. This division has been one of the mainstays of the standards committee and, in the past year, has been engaged in reconciling its early recommendations with the changes which have come about in the industry. At last summer's meeting an extremely complete and comprehensive report was given to the society, and the work now in hand is a still further ironing out of the specifications and recommendations already enforced.

Among the suggestions which will be given to the society next winter is the raising of the limits for phosphor and sulphur content of steel to 0.045 and 0.054 respectively, in order to meet present commercial conditions in the steel industry. Mr. Zimmerschied pointed out that the S. A. E. specifications now cover steels for practically all parts of the car except the very special cases such as ball-race material, etc.

The data relative to test pieces also are being refined and sheets will be issued in the near future covering a modified 2-in. test piece, the flat strip and gray iron test pieces which have been adopted by the American Society for the Testing of Materials and also a standard method of conducting the hardness test. The division also is working to adapt all the

test specifications of the S. A. T. M. to the needs of the automobile industry. The recommendations in these various matters will be ready for presentation to the society in June. There was no discussion.

Among the points of greatest general interest that were made at the meeting of the standards committee was the statement that a properly-designed license plate with figures 3 in. high could be read as distinctly at the usual legal distance as the one with figures 6 in. high. Another was the recommendation by the same division that tail lights be placed centrally over the rear license number.

No Dimmers Recommended

A startling announcement was that by the electrical equipment division that there were no dimming devices on the market that could be recommended by the S. A. E. The committee adopted a uniform location and size for distinguishing marks on the chassis of motors which will be a benefit in the prevention and apprehension of theft of cars. As to the strictly technical work effected by the committee meeting there was a great deal of value in it to the engineers of motor car plants and part makers which also is indirectly valuable to owners as well, such as the standardization of wire sizes, tire pump basis, clutch housings and other features of design which make for uniformity and accessibility of the product.

A very detailed report was given by John G. Utz as chairman of the hard-working miscellaneous division. Considerable progress has been made toward recommending standards for license plate and holders, which subject is now in a very chaotic condition, since the legislature of each State has followed its separate whim in the matter of the size and shape of licenses.

The committee is not attempting to fix a standard for the size of the plate, but believes it is possible to reach a standard on the location of the four holes for attaching which will be acceptable to all the States. Fig. 3 shows the location of these holes in both license pads and in the holders for attaching them to the front and rear of the cars. For the rear bracket, the committee believes that a central light placed at the top of the pad is the most feasible and most efficient.

In relation to this subject, the division has made a study not only of the license plate in use throughout the country but also of legibility. In this regard the report goes quite fully into the standard tests of opticians and gives some interesting data showing that characters 3 in. high with ½-in. strokes can be used for car numbers with the best results:

Miscellaneous Division

At a meeting held in Detroit on Oct. 8 the work of the July meeting of the miscellaneous division was reviewed, and some slight changes made under each head. The following minutes therefore summarize the entire work of the division since the June meeting of the society:

License Plates

It is proposed to standardize the location of four holes for attaching license plates to their supporting brackets. These holes to be located symmetrically with respect to the vertical center line of the plate, and preferably also with the horizontal center line. The horizontal distance between hole centers is to be 7 in. and the vertical distance from 3½ to 5 in. Holes are to be ¼ in. in diameter, and located on centers preferably ½, not over ⅝ in. from the upper and lower edges of the plate. The horizontal distance was changed from 8 to 7 in., because wide brackets often cause interference with radiator studs, and to accommodate the few extra short tags.

Discussion of the size and number of characters required brought out the suggestion that one prefix letter with four digits provided characters for 200,000 cars, without using letters like I, O, C. G and Q, which might cause confusion. This will probably be a sufficient number for any state for some time yet, and it is more easily read, as well as shorter, than a number with six digits.

Figures 4 in. in height are used by many states, the height being often specified by law. In order to get the long numbers on a plate of reasonable length it has been found necessary in many instances to crowd the digits both as to width and spacing. It is thought that characters 3 in. in height, with strokes of ½ in. and at least the same amount of opening between strokes and space between letters, will make numbers which can be read at fully as great a distance.

A careful statement of the reasons for adopting the standard as suggested has been prepared for the purpose of influencing state officials and legislatures, probably through the various automobile clubs, to adopt license plates in accordance with the proposed standard. Another statement has been prepared concerning brackets for supporting these tags, for circulation among motor car manufacturers.

Makers' Number Location Recommended

At present the finding of the makers' identification number is very liable to be a wild-goose chase as there now is no uniformity as to its location. The National Automobile Chamber of Commerce, Inc., has brought this matter to the society's attention and the miscellaneous division recommends that the number for the car shall be placed on the outside flap of the right frame member as far forward as possible and stamped in in letters ¼ in. high.

The division wishes to discourage the use of plates instead of letters stamped into the frame because of the ease with which these plates may be lost on old cars. Of equal importance to owners, dealers and police department is the location of the motor number, and the division recommends that this mark be stamped on the top of the crankcase as far forward and as near the middle as possible. The recommendation was made as follows:

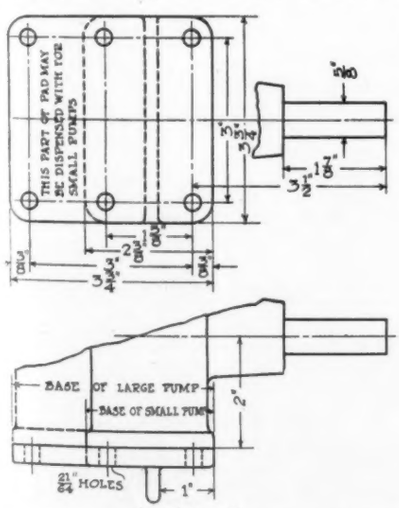
Location of Makers' Identification Number

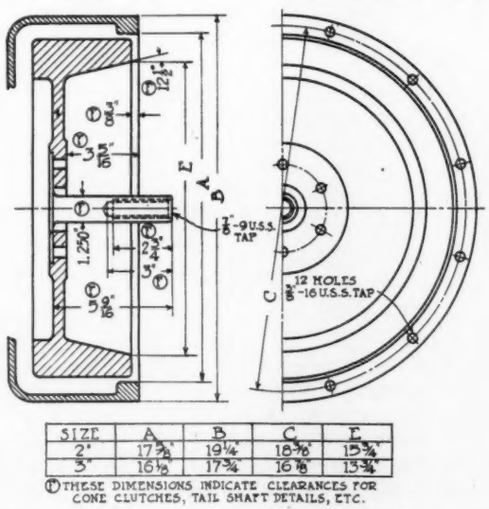
It is recommended that the standard location for the car, chassis, or frame number (whichever is used for identification) shall be on the outside flat of the right hand frame member as far forward as possible; and that such number shall be heavily indented in the frame side member in characters not less than ¼ in. high Where this location is inaccessible, it should be approximated.

The use of attached plates in lieu of numbers stamped as specified is discouraged by the division, because of the ease with which a plate can be removed.

Location of Motor Number

It is recommended that the standard location for the motor num-





SIZE	A	B	C	E
2"	17⅜"	19¼"	18⅞"	15¾"
3"	16½"	17¾"	16⅞"	13¾"

①THESE DIMENSIONS INDICATE CLEARANCES FOR CONE CLUTCHES, TAIL SHAFT DETAILS, ETC.

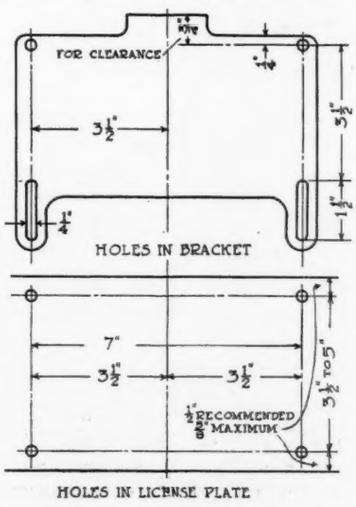


Fig. 1—Left—Proposed recommendations for pump bases designed to fit present pumps. Fig. 2—Center—Proposed flywheel housing and cone clutch details. Fig. 3—Right—Suggested license bracket proposed by miscellaneous division

ber be on the crankcase proper, as far forward, on top, and as near the middle as practical crosswise, preference being given to the right side. Consideration should be given to accessibility in the completely assembled car. The number should be deeply indented in the crankcase in characters at least ¼ in. high.

In stating the weight of the car, the division specifies that this shall mean the actual scale weight of the car complete with catalog equipment less fuel and water.

Standard Weight of Car

It is recommended that the S. A. E. standard weight of a car shall be the actual scale weight of the car with complete catalog equipment, less fuel and water.

Tire Pump Base Recommended

Once before the subject of tire pumps has received the consideration of the committee, but the standards developed at that time became obsolete with the changes made at the time that starting and lighting equipment was added by the manufacturers. Recommendations now made are for standardizing the bases and location of holes in same rather than standard dimensions for the mechanical tire pumps themselves. Fig. 1, shows the proposed recommendations, and it is stated that although this base or pad does not exactly conform to any one pump on the market it has been laid out so that it will carry any design now made. In some cases, however, an adapter plate must be used in fitting a pump to such a base. The recommendation was as follows:

Tire Pump Bases

It is recommended that engines be fitted with pads for tire pumps 3¾ in. square, having six 21/64 in. holes located as shown in the accompanying sketch. If a rib is used at the under side of the pad it should be located as shown.

It is recommended that tire pumps be made to conform to four of the six holes, using two on each side of the location shown for the rib. Shaft height is to be 2 in. and total projection of the shaft is to be 3½ in. from the center line of the nearest pair of holes in the base. The exposed end of the shaft is to be 1⅞ in. in length and ⅝ in. in diameter.

These matters of license plate, car and motor numbers, weights and tire pump basis were all accepted by the committee for presentation and action at the next meeting of the society in January.

Miscellaneous Division Progress

Progress was also reported by the miscellaneous division on the subject of piston rings, hose and hose clamps and speedometer drive connections. Screws for cowl boards were before the section but it appears that all the cowl fastenings are to be out of sight on the new cars and it is probable therefore that this subject will be dropped. The matter of specifications for hydrocarbons will be referred to a special committee having expert knowledge on the subject. Specifications for clutch facing and V-belt and pulleys for fan will probably be referred to the new motor and transmission committee. The matter of thread tolerances is awaiting the action of the American Society of Mechanical Engineers in order to save a possible duplication of work in this regard. There was no discussion.

Progress reports were given for the international standards ball and roller bearing, pleasure car wheels, and research division. The propaganda for an international standard for solid tire sizes is receiving very favorable support, and it is expected that our government, the British consular service and the British trade organizations will all lend aid to the formation of such a standard.

Work on Taper Roller Bearing Eyes

At present the ball and roller bearing division is gathering data looking to the standardization of taper roller bearing sizes and although it will be several years before all parties are able to come to an agreement on the subject, a standard in this direction looks hopeful at this time. Besides the investigation relative to tap drill sizes the research division has recently been assigned work of developing a standard method of carrying out acceleration tests.

In the report of the truck standards committee W. P. Kennedy said that his section had voted against the branding of solid tires with their equivalent millimeter dimensions. The section, however, is developing a table for the S. A. E. hand book which will give a conversion between the American and European sizes of tires. The addition of a 32-in. truck wheel has been suggested to the division for use on small, cheap cars, but as no special demand seems to have arisen for this size the committee men do not believe it is advisable to add it to the standard. In relation to industrial truck sizes, the division feels that due to the unsettled practice in this field, it is only warranted in recommending standards for wheel diameters which are as follows: 10, 16, 20, 22 and 27 in.

Another of the very complete reports submitted was that of the automobile spring division which was presented by W. M. Newkirk in the absence of Chairman McKinley. This report dealt largely with notes on the basis of purchase and the chemical and physical tests to be given by buyers of springs. Sketches were submitted showing the proposed method of making tests upon the different classes of springs which will be presented to the society in January.

The proposed tentative specifications for automobile springs appear below:

Basis of Purchase

1—(a) These specifications cover all leaf springs for automobiles.

(b) Springs shall be made of carbon steel bars, conforming to the requirements of the Standard S. A. E. Specification No. 1095 for Carbon-Steel bars, unless alloy steel bars are specified by the purchaser.

(c) When alloy steel bars are specified, the manufacturer and the purchaser shall agree upon the type and grade of the bars, which shall conform to the Standard S. A. E. Specifications for Silico-Manganese-Steel bars, No. 9250 or 9260, or to the specifications for Chrome-Vanadium-Steel bars No. 6145 or 6150.

(d) Other steels shall be a matter of agreement between purchaser and manufacturer.

SEC. I. CHEMICAL PROPERTIES AND TESTS

Check Analyses

2—(a) A check analysis may be made by the purchaser of each size of spring steel bars involved. This analysis shall conform to the requirements specified in Section 1 (b), (c) or (d).

(b) In case samples for analysis from finished springs are required, such samples shall be taken from the unworked (referring to hot work) portion of the plates and shall represent the full cross-section after rejecting any decarbonized material.

SEC. II. INSPECTION, PHYSICAL TESTS AND REQUIREMENTS OF ELLIPTIC SPRINGS

Workmanship

3—(a) The purchaser or his representative may examine all springs in each lot for workmanship, general dimensions and capacity.

(b) The springs shall be submitted for inspection complete, in the condition required by the drawings and shall conform to such drawings, within the variations allowed by these specifications. Dimensions which affect the contour only and do not affect the interchange or service of the springs need only be approximate.

(c) The springs shall have the leaves uniformly graduated in length, properly bent, and fitted reasonably true to curves given in the drawings.

Test Springs

4—(a) From each lot of springs which has met the requirements of Section 3, the purchaser or his representative may select for physical tests, at least 25 per cent, to be tested preferably in accordance with the "Compression" Method of Section 6.

(b) If any of the springs representing a lot fail to meet the requirements as to physical properties specified in Section 6 or Section 7 as required, but at least half of the springs representing a lot do meet these requirements, each spring shall be tested and those which meet the requirements, shall be accepted. If more than half of the springs representing a lot fail to meet the requirements as to physical properties specified in Section 6 or Section 7 as required, the lot represented may be rejected. The number representing the lot must be at least 25 per cent of the lot.

Method of Support and Measuring

5—(a) Full elliptic springs shall be tested in the upright position, while one-quarter elliptic, half-elliptic, three-quarter elliptic, and cantilever springs are to be tested in the inverted position and must be so supported as to give free lateral movement on compression.

(b) The anvil or pressure block of the testing machine shall be formed to sketch shown.

(c) Unless otherwise specified, all measurements of height are to be made as follows: In half-elliptic springs, between the surface of the pressure block and a line joining the centers of the eyes; in full and three-quarter elliptics, between the surfaces of the upper and lower pressure blocks; in one-quarter elliptics, between the center of the eye, and the supporting pad of the spring, measured at right angles to the surface of the latter.

Compression Method

6—(a) Free Height:—The spring shall be placed in the testing machine, as specified in Section 5 and a test load of 150 per cent of the specified working load shall be applied (provided the deflection corresponding to this load does not exceed the maximum possible on the car, in which case the load corresponding to maximum deflection shall be used), then fully released and the height measured. This shall be known as the "free height."

(b) Loaded Height—The specified working load shall then be gradually applied and the height measured without rapping or

otherwise disturbing the spring. This shall be known as the "loaded height" and in the case of pleasure cars shall not be less but may be ¼ and ⅜ more than that specified for front and rear springs respectively.

Note: Loading Precautions—Should the specified working load be accidentally exceeded in conducting the test for loaded height, the measurement of height should not be made after merely releasing the load to the specified figure but the load should be removed to not over one-half the specified working load, after which it is to be again brought up to the specified figure at which measurements are to be made.

(c) Permanent Set—When the loaded height has been determined the spring shall be fully released and then its height at 75 per cent of the rated load measured as in the previous method. Following this the spring shall be compressed to 200 per cent of its rated load or to limit of possible deflection on the car, fully released and the 75 per cent load again applied and the height of the spring again measured. Any difference between the first and last heights thus found is the permanent set and this shall not exceed 1/16 in. If there is a permanent set which does not exceed 1/16 in., the spring shall be loaded twice to 200 per cent of the specified working load or to limit of possible deflection on the car, released, and the permanent set again measured. There shall be no increase in the permanent set.

Rate per Inch or Flexibility

7—(a) When the rate per inch, or the flexibility is specified, this should be given in pounds per inch. This should be determined by taking the height at 75 per cent of the rated load and at 125 per cent of the rated load and by dividing the difference in load by the difference in height, the resulting figure gives the average rate in pounds per inch, or flexibility.

This figure shall not vary from that specified more than 5 per cent plus or minus.

Reworking

8—Any springs which fail to meet the requirements of these specifications as to dimensions or tests may be again submitted after being remade by the manufacturer, such remaking to consist of insertion of new leaves or of annealing, reforming, and retreating of old leaves. No springs shall contain cold reworked leaves.

SEC. III. MARKING

Marking

9—(a) The name or brand of the manufacturer, the year and month of manufacture, and if specified, the purchaser's class or grade number, shall be legibly stamped on each spring at a place not detrimental to the life or service of the spring.

(b) Any stamping by the inspector shall be so placed as not to be detrimental to the life or service of the spring.

SEC. IV. INSPECTION AND REJECTION

Inspection

10—The inspector representing the purchaser shall have free entry at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the springs ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the springs are being furnished in accordance with these specifications. All tests (except check analyses) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Rejection

11—Unless otherwise specified, any rejection based on tests made in accordance with Section II, shall be reported within a reasonable time from the receipt of samples.

Rehearing

12—In case of dissatisfaction with the results of the test, the spring manufacturer may make claim for a rehearing within two weeks. Samples tested in accordance with Section II, which represent rejected springs, shall be preserved for this length of time.

Report of Electrical Equipment Division

The report of the electrical equipment division was made by W. H. Conant, chairman. He stated that at the last meeting the division took up the work of establishing the standard sizes of wire for motor cars in the endeavor to select four sizes for starter motors and three separate sizes for generator and lighting equipment. The division is deferring the make-up of the wire and is not submitting recommendations on that at the present time.

It has appointed a sub-committee on insulation so that it will be possible to specify by number or letter the exact installation size as well as the exact size of the wire and later perhaps the make-up or stranding of the wire. The sub-committee also is reporting on uniform tests for wires to check up the specifications as provided by the Railway Signal Association and the Institute of Electrical Engineers. On the subject of bulbs and bases it was found that most manufacturers booked their favor on the S. A. E. recommended practice.

It was decided by the division to attempt to standardize the application of starting motors; also to proceed with the matter of wire installation.

Glare Remedy Is Improved Design

In presenting the findings of the division on the subject of headlight glare, Chairman Conant touched on a point of wide interest to motorists, accessory men and manufacturers. He stated that the division was convinced that there was no such thing as a successful dimming device, that the only remedy for headlight glare was to improve the focusing of light, to improve the sockets, reflectors and the lenses and properly to standardize the height and tilting angle of the lamp; that is, that the beam of light should strike the ground at a certain distance in front of the car and should be of a certain width.

In dilating on this it was stated that the division did not recommend dimming devices; that the root of the solution was so arranged in the lamp that the rays be projected forward in a parallel beam and not as a cone. This was a progress report only.

Visit Standard Oil Refineries

After a vote of thanks to the Chicago Automobile Club for hospitality to the standards committee meeting the standards committee returned to accept the invitation of Mark A. Smith of the Standard Oil Co., to go through the refineries at Whiting, where they watched the transformation of crude oil into high-test gasoline, lubricating oils, greases, benzol, medicine and even wax candles.

Standards committee of the Society of Automobile Engineers inspecting the refineries of the Standard Oil Co. at Whiting, Ind.

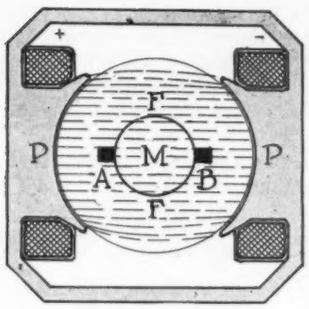


Fig. 1—Position of brushes AB for drawing maximum current from armature M. P are the poles of the generator and F the magnetic field In this position the brushes connect that particular wire in the armature which is cutting or crossing the magnetic field at the maximum speed. The true state of affairs is a little different as field is never parallel.

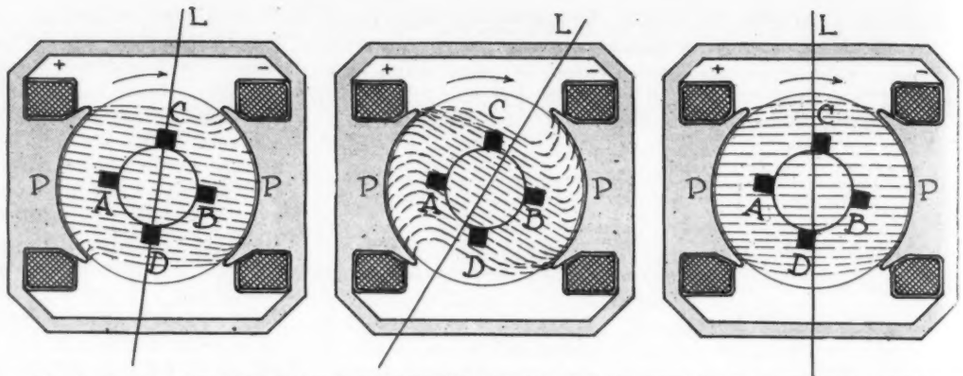


Fig. 2—In left view lines of force are normally distorted by the speed of the armature, brushes A and B are the main brushes and are drawing full current since they are at right angles to the lines of force. C and D being parallel with the lines are at zero potential and no current passes between. Center. Field is more distorted by greater speed of armature so that middle or neutral line of field L is moved so that brushes C and D come to left and right of it. Then current will flow from C to D say, but it will be smaller than the current between A and B because the brushes are closer to the neutral line. Right. Armature has slowed down till distortion has gone from field; which brings neutral line L to left of brush C. Then current will flow from D to C while the direction of flow between A and B remains unchanged, since neither A nor B has passed the neutral line L. This action is just as though the left and right sides of the dynamo were plus and minus, the dividing line being the neutral line of the field. Any brush to the left is plus and any brush to the right is minus say, while on the line is neither plus nor minus but simply zero

Automobile Electricity

The Theory and Practice of Different Lighting, Starting and Ignition Systems Explained and Considered

By A. Ludlow Clayden

IN the early days of motoring it was necessary for a driver to be more than a little of an electrician. Then came a time when, thanks to the perfection of the magneto, electricity seemed a thing of the past and one might forget that there was such a thing as a spark in the makeup of a chassis. Again, times changed and the storage battery erstwhile losing in favor, returned to service, and dynamos, motors, fuses and cutouts returned to worry the engineer and occasionally to perturb the user of a car.

We have been and are still in a period of transition, for the automobile of today is certainly as little like the car of 1920 as it bears resemblance to the car of 1910. What way the coming development will trend no man living can foretell, but it is safe to assume that electricity, which now takes a part in the daily life of every civilized man, is far more likely to strengthen its grip upon the gasoline automobile than it is to loosen the grasp it has already. If this be true, and there is little doubt of it, then it is important that every engineer and every user of a car who aspires to get the best service from it should see to it that his understanding of electrical development is thorough.

The magneto displaced dry cell or battery ignition not because it was simpler—for it is vastly more complicated—but because it was more reliable and *less trouble to look after;* similarly the electric lighting outfit came into favor because it was less trouble than gas lamps. Having the dynamo and the battery for lighting it was natural evolution to add the cranking motor, and then to eliminate the magneto which was no longer essential with an ever-charged storage battery at hand. Furthermore, the lessons taught by the magneto as to the construction of high and low-tension current distributing apparatus were not lost upon the present-day manufacturers of ignition timers, so that the modern equipment combines the mechanical excellence of the magneto with the electrical simplicity of a battery system.

The Return of the Timer

In changing from magneto back to battery and coil—even though these units may be, and are, of a vastly improved character—we lose one thing only, and this is the natural tendency for the magneto spark to intensify as the speed rises. The natural advance of ignition point, the greater heat of the discharge at high speed and the absence of mechanical parts to produce this result are the outstanding advantages of the magneto. Automatic advancing timers, and timers which cause the contact at high speed to be of longer relative duration, can overcome the natural shortcom-

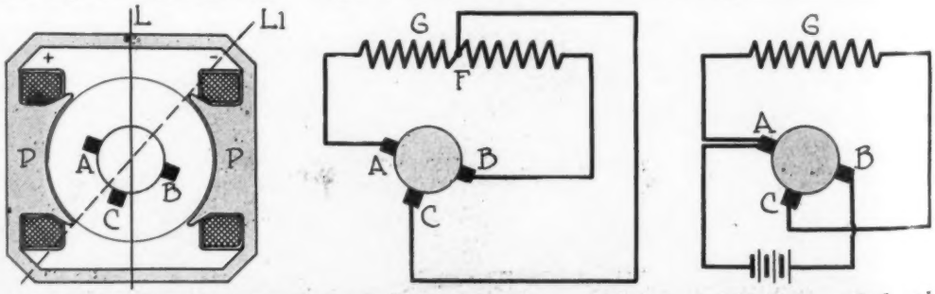


Fig. 3—Regulation with single brush. Left, at starting neutral line of field L is vertical and brushes A and C are to left of it on plus side while brush B is alone on minus side. When speed increases neutral line L first comes into line with C so that the third brush becomes inoperative, and when speed is still higher line L comes into the dotted position. Then C is on minus side and current from it tries to flow back to A instead of to B. Right—Connections for system. As long as C is plus current flows from F to B along with current flowing from A to B. As soon as C is minus its current tries to flow back to A. G is the field coil or shunt winding of the pole pieces

ings of battery ignition, so it is reasonable to suppose that the day is not far off when electrical knowledge will have reached a point which will allow of complete modification of the magneto *as we know it to-day*. It may be some time before everyone is satisfied that the day is here, but come it must sooner or later.

In considering the necessary output for the dynamo we have to remember that it has:

To furnish enough current to serve the ignition.

To provide enough electrical energy to light the lamps for a reasonable average length of time per 100 miles run.

To give the maximum possible output for the minimum possible weight.

To absorb the minimum possible power to drive.

The last two requisites mean that the current must be of a character that best suits the conditions of battery charging, that the dynamo must be operative over the widest possible range of engine speed and that the electrical and mechanical detail must be of the highest class.

There are a variety of things which make the electrician's task especially hard. First, the machine has to be able to withstand a great amount of abuse, it has to be fool proof in the most literal sense of the term.

Secondly, the machine has to be able to bear extremely high rates of revolution, extreme variations of temperature and excessive vibration or shock.

Thirdly, it is necessary to introduce some means of keeping the voltage constant at armature speeds from something like 1,000 to nearly 10,000 r.p.m.

Lastly, these, and a variety of lesser conditions, must be observed and provided for effectually at a minimum of cost.

There is as much difference between designing a dynamo to run in a power station and a generator for an automobile as there is between a gas engine for stationary service and an automobile motor. That the trade has risen so nobly to the demand is positively wonderful, that the generators in common use are so good is little less than a miracle and redounds to the credit of those who have been responsible for the development.

Methods of Control

Descending (for a moment only) into elementary electric theory, a definite voltage will drive different amounts of current through different circuits, according to the resistance thereof. Suppose we have two terminals like the terminals of a dynamo that is running at a constant speed, and suppose we connect two different circuits to those terminals, the circuit with the smaller resistance will take a current greater than that passed through the circuit of greater resistance; the currents will be in inverse proportion to the resistances. This is expressed by the law that the current in amperes flowing through a circuit is always equal to the voltage, divided by the resistance of the circuit measured in ohms.

In an electrical system for automobile lighting we are bound to have a practically constant voltage in the main circuit because the lamps will operate only within narrow limits of voltage. But we need different amounts of *energy* according to the state of affairs at the moment. Electrical energy is the product of the voltage and current. Suppose that we have only the small lamps in use, we need a definite voltage but only a small current, but if we now switch in the large lamps we need more current at the same voltage. Again, if the battery is low we need current to bring it back to the fully charged state, and the nearer it approaches to the fully charged condition the less current do we need. This means that the *energy* demand on a car is always fluctuating while the voltage demand is constant.

If we have a generator with constant voltage regulation and constant current regulation also, it means that however fast we drive it, the energy given out cannot exceed a definite amount. If there is no regulation of current it is possible to increase the output in watts of electrical energy to meet the conditions of the moment. In some systems there is a good deal of energy wasted by conversion into heat—the output is kept down by the absorption of part of the current. In others the power used to drive the generator is more or less directly proportional to the current being used. There are reasons for and against each system, for the power used to drive the generator is so small that a little wastage is worth while if we obtain some other advantage such as simplicity of construction.

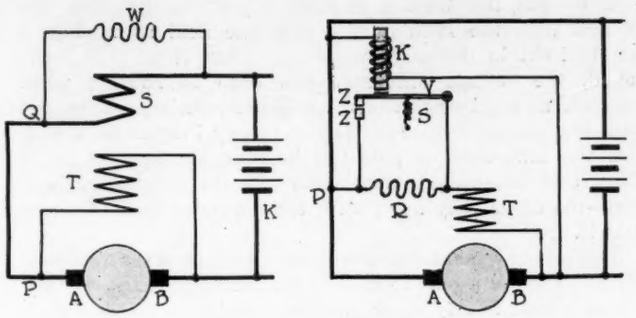


Fig. 4—Left—Bucking Coil Regulation. Current flows from A through the shunt coil T and so back to B all the time. Also some of the current divides at point P and goes through the opposing series coil S and thence to the battery, through the latter and back to B that way. But the current which takes this circuit has also a choice of routes at Q; it can go through the iron wire W as well as the series coil S. The greater the current the hotter does the iron wire get and the less current will it pass, so more and more goes through the series coil S, so acting against the magnetism due to the shunt coil T and preventing the field magnets from becoming too strong

Fig. 5—Right—Vibrator Voltage Control. T is the shunt coil of the field magnets. Current from A flows round the outer circuit through the battery and divides at P, part going through the shunt winding. Also there is a branch across the outer circuit through the little coil K. There is a spring reed V, which is pulled down by a little spring S so that the two contact pieces ZZ come together and then current flows from P to Z and thence through T back to B. When the current through K is strong enough this pulls apart the contacts Z, forcing current to go from P through the resistance R and so to T. This cuts down the current in T by reason of the resistance of R, the voltage drops and K lets go of V. Whereupon voltage rises again and the process is repeated thousands of times every minute

It is necessary to remember that a fixed voltage delivers a current in inverse proportion to the resistance of the circuit. This means that if the regulating resistance is part of the *main* circuit it regulates the current available for battery charging as well as regulating the exciting current in the field coils. If, on the other hand, the regulating resistance is interposed simply in the *shunt* circuit the current flow in the main circuit depends upon the resistance therein, and upon nothing else.

Of course there is no such thing as an absolutely constant current generator or an absolutely constant voltage one either; both vary a little as speed rises and falls, but the best machines approximate closely to fixed values.

However a generator has its field coils wound the voltage will increase as the speed of the armature rises, as long as conditions in the outer circuit remain unchanged. Our ideal for automobile work is a machine which will produce a voltage of unvarying degree and an amount of current to suit the demand of the moment.

The first idea was to do this by means of a mechanical governor which would prevent any current from flowing till the dynamo was running fast enough to give the desired potential, and then to keep it at just that speed whatever the speed of the engine. This scheme seemed to have the merit of simplicity, but it soon showed the demerit of susceptibility to wear, dirt and maladjustment.

Meanwhile a kindred problem that had engaged the attention of electrical engineers was the lighting of railroad trains and a type of dynamo which became popular for this purpose was the third brush regulator. This was soon taken up for automobile purposes and is still largely used.

If we put the brushes in such a position that they are in line with the lines of the magnetic field as in Fig. 1 we shall obtain the maximum current, but if we shift them round, the voltage difference will drop to nothing when they are at right angles to the original position, and in line with the magnetic lines of force. At any intermediate position the difference of potential between the brushes is in proportion to the angle they make with the inoperative position—the angle they make with the magnetic lines of force, that is.

Suppose now that we use four brushes on a two-pole dynamo and set a pair to give us the maximum current, then a pair placed in any other position relative to the armature will give a smaller current. By causing the excitation of the field magnets by a shunt winding between the main brushes we shall have too strong a field at high speeds and too weak a field at low rates of revolution. Just as the current at the main brushes rises and falls, so will the current at the subsidiary brushes; and, if we connect the latter by a magnet winding which *opposes* the main shunt winding, we can cause the excitation of the magnets actually to be reduced as the speed goes up.

There is another thing which helps us in this system of regulation; namely magnetic lag. The armature tends to drag the magnetic field after it, so the lines of force instead of passing straight from pole to pole really lie diagonally. The higher the armature speed the more are the lines of force pulled out of straight. But the maximum current is still to be had when the brushes are at right angles to the lines of force, for which reason the brushes are usually set a little "retarded" and not at right angles to the pole pieces.

This shifting of the magnetic field has a profound effect upon the current in the subsidiary circuit. Suppose we set the auxiliary brushes so that—at normal speed—they are at the position of no difference of potential; see diagrams in Fig. 2. If the speed falls off the lines of magnetic force will come more nearly into line with the pole pieces and a current will flow from, let us say, brush C to brush D. If on the other hand, the speed increases, so that the magnetic field becomes more instead of less distorted, then the lines of force will cross the line joining the two brushes in the opposite direction. It is easy to see that this is equivalent to moving the brushes across the field and so *past* the position of no current. The effect will be to start a fresh current between the brushes but it will now flow from D to C.

In short, we can adjust the position of the subsidiary brushes so that the current between them will reverse its direction at any desired speed of armature revolution.

This means that if the subsidiary brushes feed a coil wound around the field magnets the current will first try to magnetize them so that the left—say—is a north pole and the right a south pole. As speed goes up, the current will decrease till it is nothing at all, and then it will flow backwards, tending to make the left pole piece a south pole and the other a north. But all this time we have the current from the main brushes flowing around the shunt winding in a constant direction, trying all the while to make the left pole of north magnetism and the right of south. Therefore, the current from the auxiliary brushes first helps that from the main brushes, and then, after a certain armature speed is passed, it *opposes* the main shunt winding. Of the two, the latter is always the stronger, so that the polarity of the machine does not change, and the windings are proportioned to keep the excitation at such a pitch that the voltage remains practically constant.

There is an ingenious way in which the fourth brush can be dispensed with, by connecting a third brush in the middle of the main shunt winding. The potential of this brush will decrease, reverse, and then increase again exactly as though the second subsidiary brush was opposite to it. This means that if current flows from A to B when the armature is running slowly, the current from C flows through half the shunt coil to B and helps the main brushes. When the polarity of the brush C is reversed, current from it tries to flow back to A against the current coming from A to B. This weakens the A to B current and so weakens the field; just as in the four brush machine, we can set the neutral speed by adjusting the brush C moving it a little one way or the other around the commutator. This is shown in Fig. 3.

Another method is to wind the magnets with a plain shunt coil between A and C which leaves B unconnected with the field winding. Of course, current between A and C varies with the changing potential of the brush C. This method is usually preferable to the original scheme of a divided field coil described above.

Bucking Coil Regulation

In order to maintain a constant voltage at the main terminals of the dynamo there are two things which must be controlled in proportion, namely the speed of the armature and the density of the field. The determining factor in voltage is the number of magnetic lines cut by the armature coils per unit of time. If the armature speeds up we can prevent voltage rise by reducing the strength of the field, and if the armature slows we can keep up the voltage by increasing the field density.

Now, the mechanical attempts to make the armature speed constant so that the field might be kept constant too were not successful, and the next step was to let the armature speed vary as in the engine speed and to introduce purely electrical means to vary the strength of the field magnets, reducing this steadily as the speed rose. One of the most popular ways of doing this (apart from the extra brush systems just described) is to arrange the shunt coils of the field magnets so that they are supplied with current from the *battery* and not directly from the armature. This gives a practically constant field such as we could get from a permanent magnet.

Having this constant field we need means for reducing its strength as the armature speed goes up, and to provide this a separate coil is wound on the fields of the opposite hand to the shunt coils, so that current flowing through it will oppose the magnetism induced by the shunt circuit. At low speeds we desire very little current in this series coil and at high speeds a good deal thereof. To vary the current in the series coil a short coil of iron wire (without any core) is connected in the circuit so that the current from the brushes has a choice of paths; it can go through the series coil or through the iron wire. When the total amount of current is small the resistance of the iron wire is low, as it is quite cold, but, if the current rises, the iron wire heats up instantly and offers a very high resistance indeed. Since the iron wire and the series coil are alternative circuits, and since the resistance of the series coil does not vary, it follows that any rise in resistance of the iron wire will cause more current to be sent through the series coil. We already know that the greater the current in the series coil the greater the opposition to the magnetizing action of the shunt coil, so by proportioning the iron wire to suit the conditions it is possble to keep the current output of the dynamo practically constant.

The voltage in this system is controlled by the battery, which means that the generator and battery together make up the supply station from which current is taken for the lamps. This point must be grasped because some other systems are different, having constant *voltage* generators instead of constant *current* machines.

Voltage Regulation by Vibrator

The most recent scheme for regulating output is to use a plain shunt winding and no auxiliary coils, but to have an external resistance that can be put into circuit with, or withdrawn from the shunt coils. This causes the excitation to vary. Now, if the current in the shunt coils varies

rapidly, the excitation will be that due to the average current. Thus, if we have a plain shunt winding and constantly put resistance into it and then take it out again, the excitation will be equivalent to the average current flowing in the coils. In the vibrator control there is a spring steel reed carrying contacts that either add the resistance to the shunt coils or take it out again. This reed is controlled by a small magnet that is a separate shunt circuit of its own—merely a bridge across the brushes, the resistance, of course, being high so that the current flow is small. The current in this branch will vary with the voltage at the brushes, so when this rises to a determined value the reed will be pulled down, and the resistance thus put into the shunt winding. The effect is to reduce the current in the shunt, to reduce the excitation and so to reduce the voltage at the brushes. As soon as this has dropped sufficiently, the little magnet lets go of the reed and the resistance is taken out of the shunt, the voltage rises again and in a small fraction of a second the resistance is again switched in. As a matter of fact the vibrator moves very rapidly, but its movement is uneven. If the armature speed is high the reed stays longer in the attracted position, when the resistance is *in* the shunt circuit, than it stays in the free position, when the resistance is out. As armature speed falls the time for which the reed stays in the "resistance in" position gradually decreases until the resistance comes to be more out than in.

This means that the average current in the shunt is controlled so that the voltage at the brushes of the generator remains constant. It will be understood that the vibrating reed moves so fast that it cannot be seen holding onto one contact or the other; the action is very sensitive indeed and extremely rapid.

It is also possible to utilize this vibrator system to control the current rather than the voltage; to limit the possible maximum of ampere output, that is. To do this the little coil which is called K in Fig. 5 is put in the main circuit instead of in parallel with the brushes and battery as shown in Fig. 5. The action is to switch a resistance in and out of the shunt circuit just as before and so limit the magnetization of the generator, but the presence of the coil K in the main circuit limits the amount of *current* that can flow therein.

In succeeding articles it is hoped to deal with the principal systems now in use, describing them in detail. It will be found that each of them, and there are a good many, depend for the regulation of their output upon one or other of the broad principles herein described and explained, although the differences in detail are great.

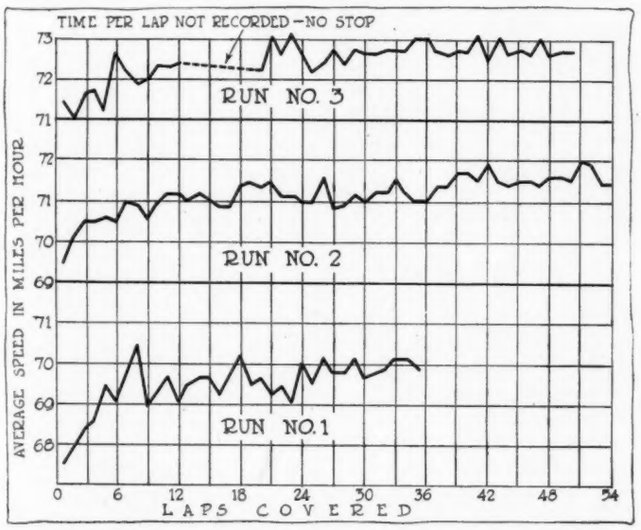
Cadillac 8 Averages 72.49 M. P. H. in A.C.A. Tests

NEW YORK CITY, Oct. 18—The technical committee of the Automobile Club of America has issued its report on the recently completed tests of two type 53 Cadillac eight-cylinder, seven-passenger cars. The object of the test was three-fold. First, to find what speed the car could maintain under varying conditions for a period of 1 hr. Second, what period of time would elapse while the car traveled 100 miles, and third, the gasoline and oil consumption measured for different rates of speed of the car.

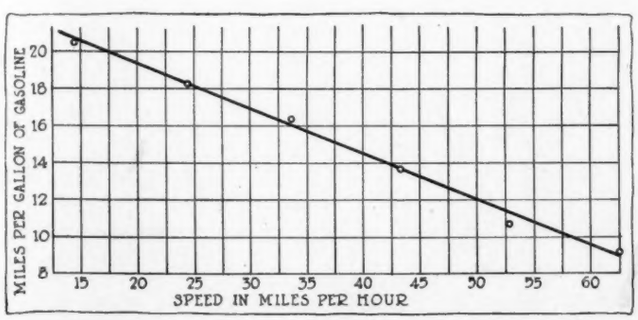
The runs for maximum speed were made on the Chicago Speedway, Sept. 21, and at Indianapolis, Oct. 5. Altogether there were four runs; first with the top and windshield, second, with the top and windshield down in both of which cases the car was driven by Philip Robertson; the third run was with the top and windshield down as in the second, but with W. J. Davidson driving. The fourth run was with the windshield and top up as in the first run with Sidney D. Waldon driving.

In the first run 70 miles were covered in 1 hr. and 25.4 sec. This is an average speed of 69.51 m.p.h. On the second run 72 miles were covered in 1 hr. and 47.4 sec., an average of 71.06 m.p.h. On the third run 100 miles were covered in 1 hr., 22 min., 46 sec., an average speed of 72.49 m.p.h., and on the fourth run to determine the miles per gallon of gasoline, the result shown on the chart herewith was obtained. At the ordinary touring speed of 14.5 m.p.h. the consumption was 20.6 miles per gallon.

Both cars used were equipped with stock motors 3⅛ by 5⅛, eight-cylinder V. The gear ratio was 4 to 1, and the tires used 36 by 4½ Goodrich Silvertown with Rudge Whitworth wheels. Both cars had seven-passenger bodies and carried extra wheels. The fuel gave a Baumè reading of 60 at 60 deg. Fahr. On all the tests the cars averaged but small fuel consumption. At the high speeds of 71 and 69 m.p.h. the oil consumptions were 114 and 173.7 miles per gallon. On the fuel economy test the miles per gallon of oil were 675. Both cars were equipped with Hartford shock absorbers and were standard stock in every way except that the muffler plugs were removed during the Chicago tests for speed, but not during the gasoline consumption tests. The results are shown in the curves herewith.



Speed per lap of Cadillac eight on runs 1, with top and windshield up; 2, with top and windshield down; 3, with top and windshield down on 100-mile run. The average speeds for the three runs were: 69.51, 71.06 and 72.49 m.p.h. for 1, 2 and 3, respectively



Gasoline consumption curve of Cadillac eight for speeds between 15 and 60 m.p.h. At 20 m.p.h. the car traveled 19 miles per gallon. This about equals touring speed

The Engineers' Forum

Aluminum Piston Critics Answered—Fresh Views Advanced on Heat Conduction Argument and Inertia Study

By Joseph Leopold and James E. Diamond

EDITOR THE AUTOMOBILE:—With all due deference to the author of Prefers Iron or Steel, printed in your columns, I would call your attention to the following:

In the first paragraph the author states: "The piston proper is heated by convection and radiation; this heat is carried off mainly by convection to the cylinder lubricating oil film and the rate of convection depends upon the maximum temperature within the cylinder and the piston speed. This heat is again carried by convection from the lubricating oil film to the cylinder wall and in turn carried by conduction through the cylinder wall proper and finally by convection to the cooling water. It then results that the conductivity of the material employed for the piston is not of material consequence."

Heat Conducted Through Piston

If heat is transmitted through the cylinder wall by means of conduction why is it not also transmitted through the piston walls by conduction? It is quite true that after the heat has been carried through the piston wall it will be transmitted through the air within the piston by convection into the "crankcase air." But if this operation is to take place rapidly, it stands to reason that the piston material must possess a high ratio of thermal conductivity. Also in the construction of aluminum pistons it is possible to employ ribbing under the head without adding any appreciable weight, which I believe tends to encourage heat radiation, and carry off the heat from the head, distributing same through the walls of the piston, when the operation of convection through the oil film, etc., will take place. I therefore fail to realize why "the conductivity of the material employed for the piston is not of material consequence."

With regard to inertia forces the author states: "I believe that automobile motors are ordinarily designed on the basis of an initial indicated pressure of about 350 lb. If this pressure is taken as the basis of construction, it is clear that the values of the inertia forces are of little moment until they exceed the indicator pressure."

To illustrate a variance of theory in this matter we may start with the piston's movement at the ending of the first half of the stroke. Here it will be seen that exhaustion has occurred and the only force acting on the piston (disregarding gas inlet which is very slight) is the inertia force. Now it is quite within reason to assume that in reversing the piston to operate on the second half of the stroke, it will be necessary to overcome the inertia force stored in the piston. And while no other element enters into the matter, inertia force depends entirely upon the weight of the object and the speed at which it is traveling. No doubt, such energy as may be accumulated in the piston during the upward or final strokes, will be of material benefit in overcoming the resistance of the gases and aiding the operation of compression. However, this advantage is greatly over-balanced by the fact that the inertia energy at the ending of the first half of the stroke is so much in excess of same. Also where a heavy piston is used the energy stored up in the piston is oftentimes so great that it is sufficient to overcome compression, therefore reversing the stresses on the connecting-rod bearings and subjecting the connecting-rod to tension. This theory can best be substantiated by actual practice, as I find that the majority of high speed motor manufacturers using iron pistons, find their crankpins worn principally on the inner side.

Practical Advantages Proved

To deviate from theory entirely and dwell on practice for a period, the advantage of aluminum pistons can best be demonstrated. The author states: "The writer has tried various aluminum alloy pistons in automobile, stationary and aeronautical motors, and in every case where a motor was operated at maximum power for long-continued periods failure resulted." This is surely in contrast to the results we have seen demonstrated. In the case of the speed boat Disturber IV., it will be admitted that the 750 hp. motor installed in this operated at maximum power for quite a period, also the Stutz car which holds the record for the fastest track time ever made by an American car in competition. The mere fact that many of the foremost and highest priced cars in this country are using aluminum alloy for piston construction, should be convincing evidence of their durability and efficiency, for a car which is sold at a price ranging from $5,000 to $8,000 could not afford to install inferior material.—JOSEPH LEOPOLD, Engineer, Walker M. Levett Co.

Considerations Overlooked

EDITOR THE AUTOMOBILE:—Relative to E. H. Sherbondy's contribution published in the Oct. 7 issue of THE AUTOMOBILE concerning the aluminum alloy piston, and in which an endeavor is made to minimize the importance of the properties of lightness and thermal conductivity on which all claims of superiority of advance for the alloy piston must rest, it is quite true that the piston receives, both by convection and radiation, its heat from the gases of combustion, and further that the temperature assumed by the piston will be a measure of the intensity of heat of the aforesaid gases.

It seems to me that one or two important considerations have been overlooked in analyzing the next steps. That the aluminum piston alloy has much greater thermal conductivity than iron seems not to be questioned. It should at once follow that the heat absorbed by the alloy piston head from the hot gases will be diffused throughout the entire piston mass in a much shorter time than would be the case with an iron piston. Consequently the temperature of the piston head will maintain a lower average, while the mean piston temperature will be higher than in an iron piston. As a matter of fact experiment has shown the correctness of this reasoning, disregarding entirely the exact process in the extraction of heat from the piston successively by oil film,

cylinder wall and water in the jacket. Is it not true that the more quickly the heat from the head may be conducted down throughout the skirt, the greater the opportunity the piston has to rid itself of much of its heat, since the further away from the piston head it is possible to conduct the heat, the greater the difference in temperature between the piston, and the surrounding media.

Condition of Heat Ideal

This being the case it seems to me that we have an ideal condition for heat extraction—two masses of widely different temperature in contact. No matter how brief the existence of this condition, there is going to be an approach toward equalization of temperature, which of course will be very much nearer that of the larger mass, the cylinder, etc., than the relatively small piston mass. If the much greater thermal conductivity of the aluminum piston alloy does not explain what follows I would be very glad to be set aright.

More evidence is available in connection with a 5-in. bore motor. The iron pistons with which this motor was originally equipped required a skirt clearance of 0.012 in., but Lynite pistons are now standard equipment on the job, and it has been found necessary to allow but 0.008 in. skirt clearance. In the other case a large number of Lynite pistons were sent out in motors, the clearances being exactly the same as those allowed for the standard iron ones. Absolutely no trouble due to seizure occurred except at very high motor speeds. In considering these cases it must be borne in mind that the expansion of aluminum is nearly twice that for iron, and for the same temperature range twice the expansion should be expected. Must not the greater thermal conductivity of the alloy explain this state of affairs? In this connection, too, I have recently learned of a case where, due to the fact that the head of the alloy piston always runs cooler than the iron one, it has been possible to increase the compression considerably without danger of preignition, whereas, when iron pistons were tried preignition invariably occurred.

Considering now the question of inertia, it is quite true that at low engine speeds this is negligible in comparison with the explosion load, but I do not believe that it is a negligible factor, by any means, at high engine speeds, and I believe the great majority of engineers are with me relative to this. Possibly even with the modern high speed, long stroke motor the inertia force is much less than the explosion load in the power stroke, but we have the power stroke with us for but one stroke, while we have the inertia forces throughout the entire cycle; that is, for the other three strokes. These inertia forces certainly must be productive of bearing pressure if nothing else, and should be comfortably missed. The fact that the Lynite piston has been standardized on, as widely as it has been, would seem to show that engineers do wish to eliminate, or rather reduce to the minimum, these inertia forces. Relative to what has been written concerning restricted valve capacity, what is the explanation for the increase in motor speed of a well known aeronautical motor from 1350 to 1450 r.p.m. by the substitution of Lynite pistons for the iron ones that formerly were standard, if the decrease of the inertia forces is not a factor? Similarly, the determining factor in the conclusion reached, to standardize on Lynite pistons instead of iron ones, by a very prominent manufacturer, was the fact that merely by the substitution of the alloy piston for the iron one, a difference of exactly 5 m.p.h., from 60 to 65 miles, in the speed of a new model was obtained.

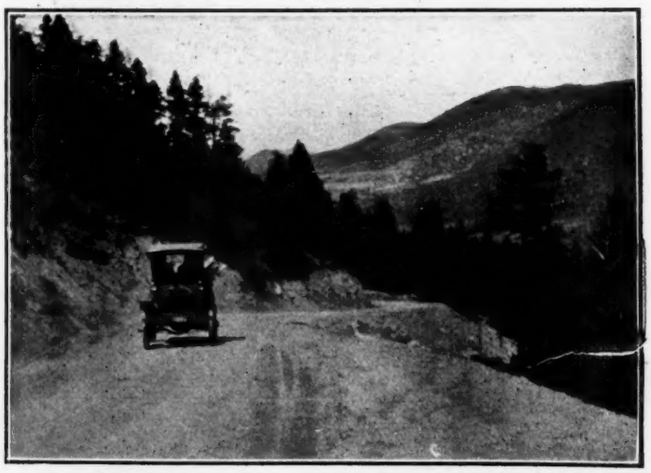
One large manufacturer building fours, sixes and eights has standardized on Lynite pistons for his fours and eights, simply to reduce the vibration occasioned by the unbalanced forces attributable to inertia conditions. I certainly hold that this matter of inertia is no minor problem.

Regarding piston friction, Mr. Sherbondy points out the ideal condition, the existence of a perfect oil film. This is, in my own opinion, never attained, and the fact that pistons do show wear would, it seems to me, substantiate my opinion that there is metal to metal contact a goodly portion of the time. I still maintain that the mechanical efficiency of a motor will be higher with the alloy piston than with the iron one. We have done considerable experimenting relative to this matter of friction, and in spite of the fact that we have had every possible opportunity for maintaining a perfect oil film—an impossibility in the motor—there is a marked difference in the coefficient of friction measured by various combinations, iron on steel, aluminum on steel, etc.

Concerning strength is it not, after all, a question of sufficient strength, not maximum strength? Certainly sufficient strength, weight for weight, with the steel piston can be had with the Lynite piston alloy to answer the requirements of even the modern high duty motor, or rather the high duty motor that is forecast by Messrs. Porter and Sherbondy.

Possibly there are conditions in a two-cycle motor which do not exist in the four; my experience with two-cycle piston applications is exceedingly limited. In another contribution of mine published some few weeks since I stated that my company had in hand orders for a half million Lynite pistons. I take pleasure in advising that this number has increased to three quarters of a million.—JAMES E. DIAMOND, Engineer, Aluminum Castings Co.

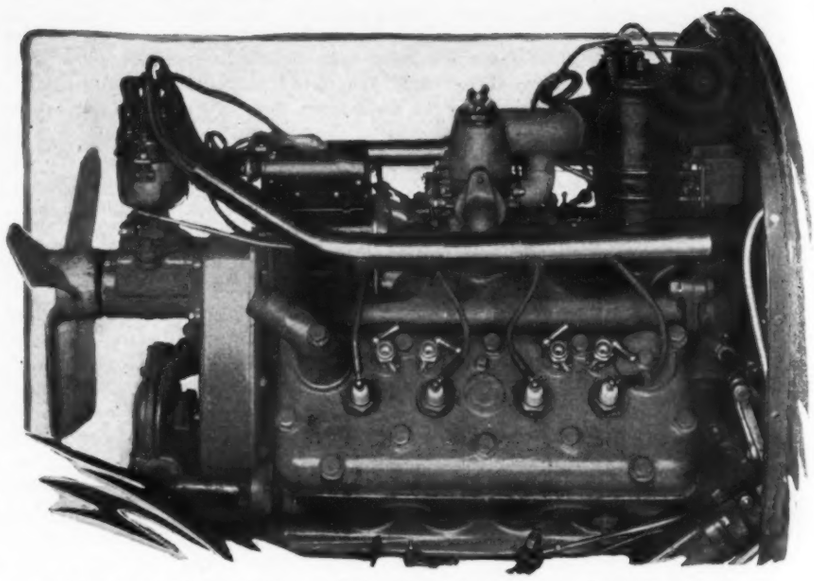
The new Ward electric coupé exhibited at the electrical show in Grand Central Palace, New York City. This car sells for $1,295 and is fitted with a 4-5-passenger body with all the seats facing forward



Two-ton worm drive Wilson truck climbing Pike's Peak. It performed this feat four times within 6 days, and on three occasions with full capacity load

Oldsmobile Light 8 Is Ready

New Northway Motor Has Many Ingenious Features

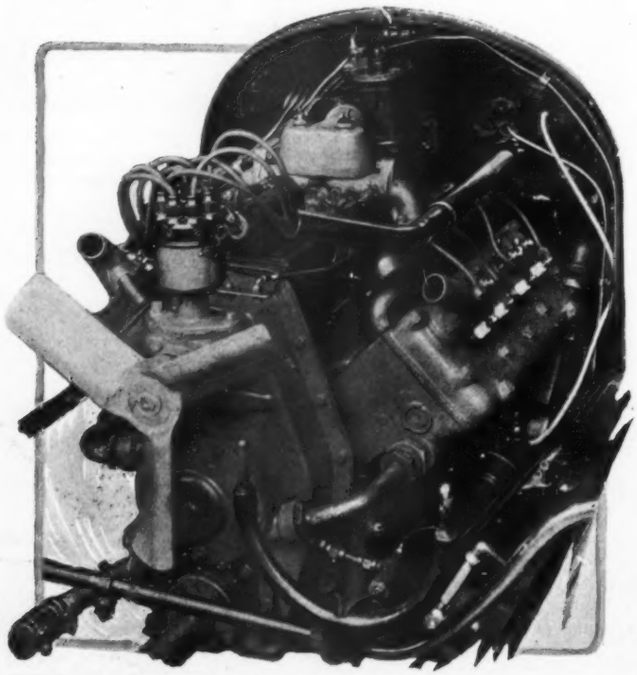


Left side of new Northway motor used in Oldsmobile light eight showing compactness of design. This motor is 2⅞ by 4¾ and although rated at 26.7 hp. it is claimed to develop 40 hp. on the brake at 1800 r.p.m.

AS has been announced briefly some months ago, the Olds Motor Works, Lansing, Mich., is now building an eight-cylinder model as a running mate for its four-cylinder car, a new type with much the same general body lines, and pronounced similarity in the mechanical construction to the four, but with its front end entirely different.

The price is $1,295, which in itself cannot but impress one as being extremely low for a car of the type. It is another instance of how the manufacturer is cutting the cost of production. Two or three years ago a car of the type at the price would have been regarded as nothing short of sensational, but to-day with all values appreciably on the up grade, the low price is less conspicuous, although the experienced man has only to examine the finish and general completeness of the job to realize that it has meant much careful planning and voluminous buying to make it possible.

Model 44, the new design, incorporates a V-type eight with cylinders 2⅞ by 4¾ in. 120 in., wheelbase, leather-faced cone clutch, floating axle, three-quarter elliptic springs, open drive shaft fitted with two universals and three-speed gearset. Thoughtful engineering has been applied in developing its ensemble. Rated at 26.7 hp. the engine is claimed to develop 40 hp. on the brake at 1800 r.p.m. It is a high-speed type with the maximum power at about 3300 r.p.m.



Oldsmobile eight motor showing mounting of electrical units and carbureter in the V. Note mounting of ignition distributer on timing gear case and Stewart vacuum fuel tank on dash

Materials entering into the construction of the power plant indicate a method to obtain maximum wearing qualities and utmost lightness. The aluminum pistons, having three cast-iron rings and one scraper ring, are relieved at the wrist-pin ends to prevent unevenness of piston expansion in the direction of the wrist-pin.

Externally the engine is very compact. Each cylinder group is integral with one-half of the crankcase, which is divided, not horizontally but vertically. The halves bolt together to give the complete engine, entirely inclosing the crankshaft with the exception of a bottom opening covered by a pan which forms the oil reservoir. The detachable cylinder heads carry the spark plugs, priming cocks and water-outlet connections.

The motor has a comparatively heavy crankshaft, supported on two bearings, a construction quite possible and feasible with a short motor where the balance is so well worked out. The main bearings are 2⅛ in. diameter and 3¼ in. long, and connecting-rod bearings are 2⅛ by 2 1.8 in. The forked-rod system is employed.

Inclined Valves Reduce Combustion Space

A single camshaft is used, it having sixteen cams, one for each valve, and to bring the ends of the tappets in direct contact with the cams, the valves are inclined at a greater angle than the cylinders, thus bringing them to the camshaft at their lower ends and swinging them in closer to the combustion chambers at the top.

The camshaft is driven by gears from the crankshaft, but outside of the camshaft gear, and on the same shaft, is a sprocket over which a silent chain runs to a sprocket on the generator, fan and distributer shaft directly above. The gears and chains are neatly inclosed by a stamping at the front and a compact appearance is the result.

One notable feature is the location of the ignition distributer, mounted on top of the support of the fan end of the upper shaft. The distributer is an entirely separate unit from the generator, and it is driven by spiral-gear connection with the fan and generator shaft. The position places it conveniently, from the standpoint of assembly and also of accessibility for adjustment.

The fan, by a nice bit of designing, is arranged for practi-

cally positive drive without noise and at a moderately high speed. Its drive is through a friction clutch, the tension in a coil spring on the end of the shaft serving to make the driving connection while the center portion of the fan acts as a housing for the spring as well as the friction part of the little clutch. The tension in this clutch is such that while the fan can be turned by hand when the motor is not running, still there is no slip when the motor is operative. This makes a flexible drive similar in action to a belt, though a more mechanical job.

Electrical System Has Three Units

Through the use of the Delco three-unit electrical system, it has been possible to dispose the electric apparatus without undue congestion of the V between the cylinder blocks, or the fitting of any unit into too small a space. By locating the generator at the rear end of the shaft that drives the distributer and fan, it has an accessible and logical position with provision for efficient drive. The starting motor is placed on the right side of the gearcase within easy reach through the front floor boards and gears to the flywheel through the Bendix drive with the shift forward. By this placing of the electrical apparatus, there is nothing in the valve-alley except the carbureter and the manifolds, besides the generator at the front end.

A good position is given the water pump which is of a double outlet type. It is mounted on the front end of the camshaft, outside the housing of the gears and chain, and this makes for the minimum of water piping, and at the same time gives a very simple direct drive for the cooling unit. A water connection runs from either side of it around the gear housing and chain to the front end of the adjacent cylinder block, while from the right side there runs the pipe connection to the radiator. This symmetrical arrangement of the pump with piping equidistant from either block of cylinders should make for very uniform cooling.

The force-feed engine lubrication uses a gear pump at the front of the motor under the timing gear cover plate. This pump oils the two main bearings under a moderately high pressure which reaches a maximum of 30 lb. to 40 lb. per square inch at maximum crankshaft speed. A check valve regulating the pressure, opens when the prescribed maximum is reached, the surplus then by-passing to the camshaft bearings and the front gears and chain. Through the drilled crankshaft the connecting-rod lower bearings are oiled and the overflow from these is sprayed up into the cylinders and the other bearing surfaces. There is an adjustment provided for regulating the tension of the spring of the check valve, this governing the pressure of the oil. The system is practically the same in principle as is working successfully on several other eights.

The Stewart vacuum fuel feed has the tank placed in the center of the back of the dash in the rear end of the engine V, which brings it close to the carbureter, making the fuel pipe very short. The gasoline tank is suspended at the rear of the chassis, as on the four-cylinder car.

Wherever possible, for the sake of standardization, the chassis of the new eight is the same as the four, but there are parts which must necessarily be heavier. There is really very little difference in the total weight of the two models, so parts that have only a weight-sustaining function did not need enlarging, whereas those taking the drive are necessarily stronger. For instance: while the two cars have the same frame and front axle, the eight possesses a heavier rear axle; the housing is a larger and heavier stamping and the driving shafts are increased, although of exactly the same general design. The gears are of nickel steel and are the spiral-bevel type to promote silence. The ratio is 4 5/12 to 1, so that the engine really has plenty of chance to handle the car well. Ball bearings are employed in the axle.

Hotchkiss Drive with Underhung Springs

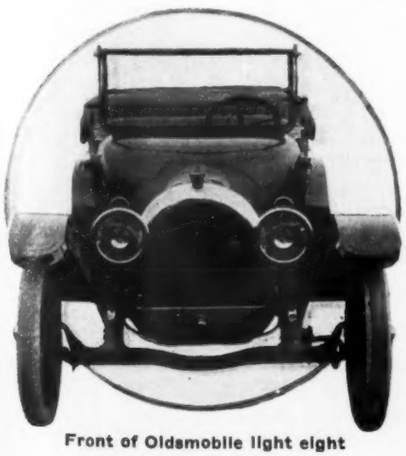
Transmission of the power from the motor is through a cone clutch and three-speed gearset in unit with the engine, and a tubular drive shaft of open type, fitted with two universals. The clutch form offers nothing radical, having engagement springs which admit of ready adjustment. It has a diameter of 12½ in. Compactness is notable in the gearset which is fitted with hardened steel gears with the transmission shaft mounted on ball and roller bearings.

In using the tubular drive shaft, the car has a stronger driving member than if it were solid, and whipping is reduced to the minimum. As in this year's four, the eight uses the Hotchkiss type of drive with the propulsion and torque taken through the rear springs, the master leaf of each being made to care for these added duties. This form of drive makes for lightness.

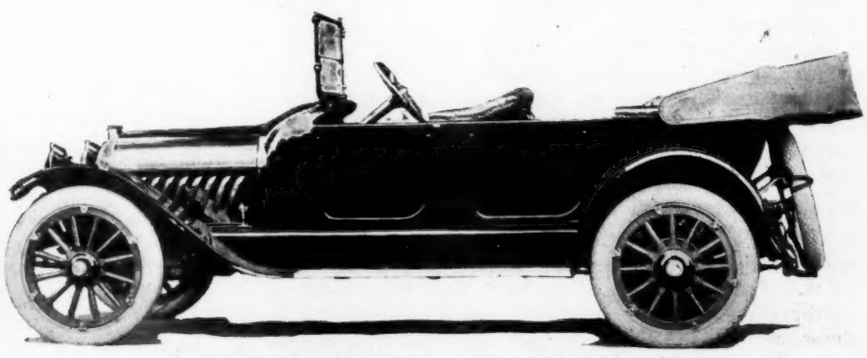
Rear springs are underhung, and like the fronts are mounted so as to be nearly flat under normal load, the idea being to promote easy riding along with good treatment of the springs. When normally flat, it is obvious that the spring action will be above and below the horizontal, making for uniformity of bending in either direction.

Every Inch an Olds

One could immediately tell the new eight as an Oldsmobile if familiar with the appearance of previous Olds' cars. The body and cowl are characteristic, although radiator and hood are more rounded than heretofore. The paneled doors, cast-aluminum running boards, Circassian walnut dash and steering wheel are all features possessed by the new model as well as the four. To afford some idea of the roominess of the body, a few of the dimensions will suffice: Doors are quite wide—23 in., and admit to a rear seat of 46-in. width; the distance from the back of the rear seat to back of front is 48 in.; the length from the back of the front seat to the clutch pedal is 41 in., and the clutch and brake pedals are adjustable.



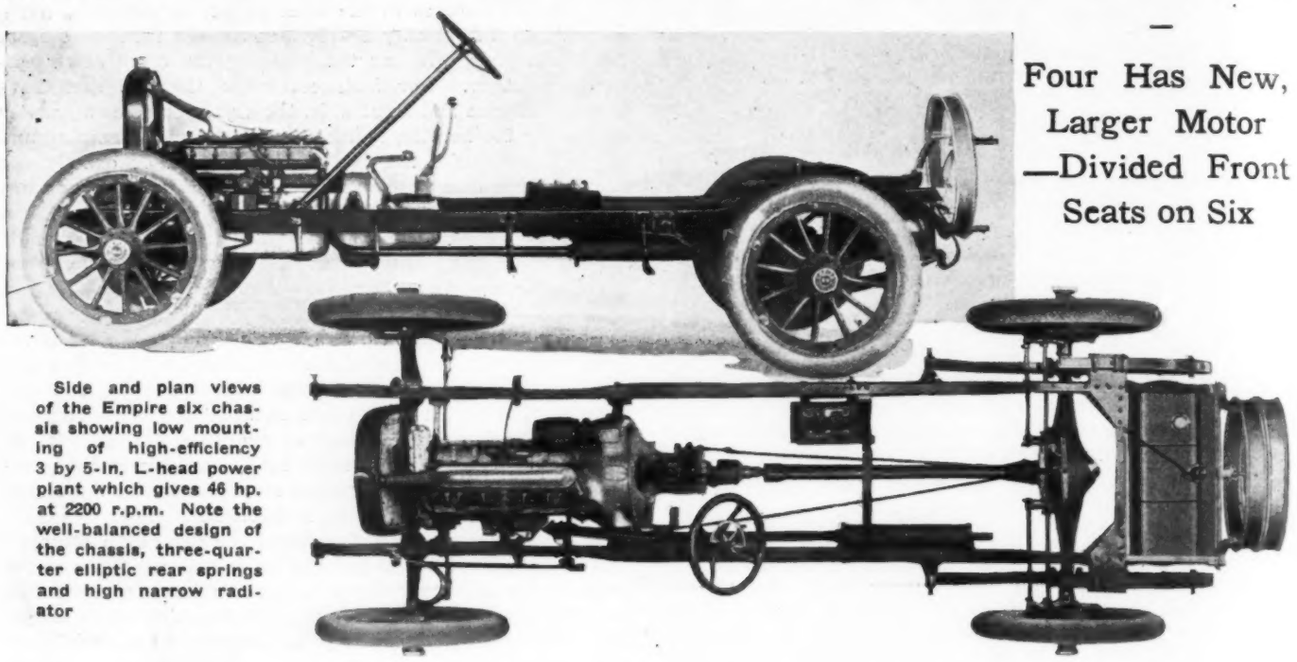
Front of Oldsmobile light eight



Oldsmobile light eight passenger car which sells for $1,295

Empire Six in Production

Four Has New, Larger Motor —Divided Front Seats on Six



Side and plan views of the Empire six chassis showing low mounting of high-efficiency 3 by 5-in. L-head power plant which gives 46 hp. at 2200 r.p.m. Note the well-balanced design of the chassis, three-quarter elliptic rear springs and high narrow radiator

IN the production of a six-cylinder touring car at $1,095, the Empire Automobile Co., Indianapolis, Ind., takes its first departure from the building of a four-cylinder car, all previous models having been of the latter type. The former four has been discontinued and a new model takes its place. Last year's four listed at $975, while its successor will sell for $895. As to wheelbase, frame, drive, axles and equipment the new four, which is a five-passenger, closely resembles its predecessor, but the power plant and body have come in for some changes.

Of the two models the six is the more attractive in point of appearance, giving the idea of massiveness with its long wheelbase of 120 in., its body with extreme roominess and a long, high hood. The body is of the curved cowl, convex-side design. There is a noticeable departure from this concern's seating arrangement in its four, the six having individual, parlor-car seats in front. The rear seat is 49 in. wide and accommodates three passengers. In the chassis of the six there is a close adherence to the previous Empire design, although it is longer and heavier than previous models put out by this company. Springs are attached the same as on the previous four, with bridge construction gusset plate at the rear, but an innovation is that the rear springs are underslung.

Another feature that has been adopted for the first time in Empire cars is the vacuum gravity fuel feed. Tires are larger than heretofore, 34 by 4 being standard equipment for the new six, with non-skid rear. The rear axle is new, being of the floating type with pressed steel housing and removable inspection cap.

Six Is High-Speed Motor

The power plant of the six is of the high-efficiency type with cylinders measuring 3 by 5 in., giving 46 hp. at 2200 r.p.m. The cylinders are of the L-head type with valves overhead measuring 1⅝ in. and having a 5/16 in. lift. A three-bearing crankshaft is used, the main bearings being split into upper and lower halves. All bearings are babbitt-lined with bronze shell. Connecting rods are 9 in. in length and the lower bearing has a diameter of 1¾ in. and a length of 2 in. Splash and plunger pump lubrication is incorporated in the Empire power plant. The camshaft is submerged in an oil reservoir, which is designed to give greater silence. Cooling is by a centrifugal pump and a Fedders high, racing-type cellular radiator.

Connecticut ignition and Schebler carbureter are standard equipment on the new six. Current is provided by an Auto-lite generator placed on the left side of the motor and is stored in an oversize, six-volt Willard storage battery. The motor is started by the Auto-lite equipment, operated on the flywheel through a Bendix drive, which marks the first time the Empire has used this type of starter on its cars.

Heavy Shafts Feature Gearset

In the power transmission all gears and nickel steel shafts are made extra heavy, while the main driving shaft is mounted on New Departure ball bearings. The universal is the Hartford, heavy car type, inclosed in a pressed steel housing to make it oil-tight and dust-proof.

The rear axle is a Weston-Mott, single-bearing, full-floating, with large housing and a 12-in. inspection cap. This has been designed to relieve the shaft of carrying weight, the housing taking care of the weight. Hyatt roller bearings are found in the axles, except behind the driving pinions where double rows of New Departure bearings are used. The front axle is dropped to give a lower center of gravity, but the standard 11-in. clearance is maintained.

Left drive with center control is found in the new six. Two sets of brakes are used, both on the rear wheel drum and the equalizer system is particularly well laid out. The hand-brake lever is connected to the equalizer by a steel cable.

Fenders are of the crown type, pressed steel, with close fitting shields. All fender edges are reinforced and the baked enamel process gives them a lasting luster. The running-boards are linoleum covered and aluminum bound. The body is among the cruiser types of the 1916 season, made in alumi-

noid steel with convex sides and rolled cowl. Semi-elliptic, 36-in. springs are found in front and three-quarter elliptic, 53-in., in the rear, while the upper main leaf of each rear spring is scrolled to do duty as a bumper plate. The frame is dropped, to lower the center of gravity, and narrowed in front to shorten the turning radius.

New T-Head Engine on Four

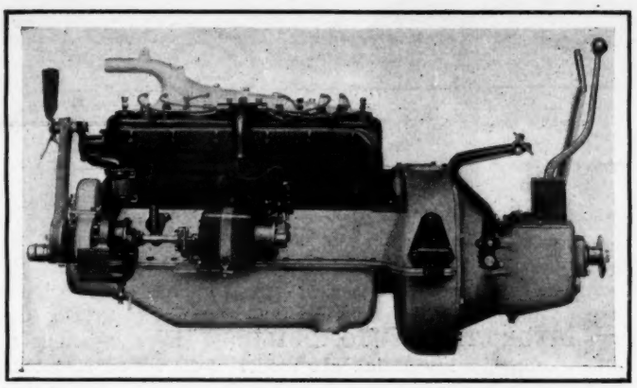
In the new four-cylinder model Empire the motor used in the previous model has been replaced by a Teetor, T-head power plant, 3⅞ by 5 in., which is considerably larger than the previous plant used, which was 3¾ by 4½ in. In this model the disk clutch has been discarded in favor of a cone. The gearset is a regular three-speed, made by the Detroit Gear and Machine Co. The new four uses Connecticut ignition system in place of the Remy found on last year's four, while the starting and lighting is by Auto-lite, two-unit, like the six. The steering post is a new one also, made by the Foster Gear Co., Columbus, Ohio. Tires are 33 by 4, instead of 32 by 3½.

The foregoing paragraph tells the principal changes to be found in the new four. Going back to the motor, the crankcase incorporates features of the barrel-type construction, giving rigidity to the bearings, of which there are three. The T-head construction allows unusually large valves with a 2-in. clear diameter. All valves are interchangeable and have cast-iron heads, electrically welded to nickel steel stems. The intake manifold passes through the cylinder block, which completely jackets it with hot water.

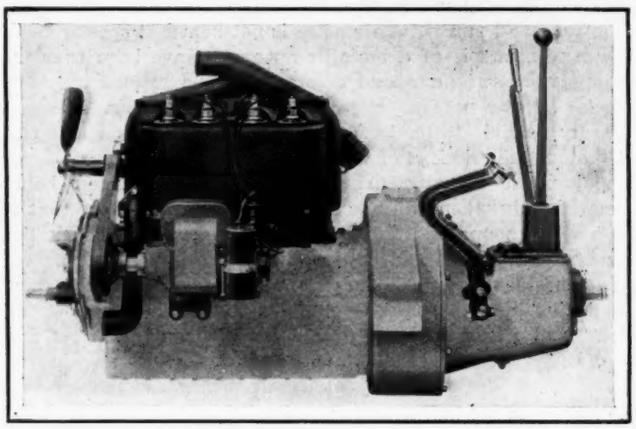
The lubrication system consists of two overflow oil basins located in the lower part of the crankcase. In the bottom of these basins holes are bored to admit a given quantity of oil. The lower ends of the connecting-rods pass through this oil, keeping a certain amount in circulation and directing excess oil to the reservoir; directly over each main bearing is an oil pocket, cast integral with the crankcase.

Cooling is by thermo-syphon in connection with a Fedders cellular-type radiator. Wheelbase is 112 in. and the body is of the conventional streamline design. Exceptional leg room is given by the wide, low-set seats. Upholstery is of leather throughout. The gravity system of fuel feed is employed in the four, from a 14-gal. tank under the front seat. Semi-elliptic springs in front and three-quarter elliptic in the rear are used, the latter being also underhung.

Equipment for both the four and six is practically the same, and includes combination head lamps with powerful searchlights for country driving, tail and tonneau lights, one-man top with curtains operated from inside the car, rain vision, ventilating windshield, Stewart speedometer, Stanweld demountable rims with one extra, dash carbureter adjustment, twin spare tire carrier, rubber shock absorbers for front and rear springs, robe and foot rails, motor-driven horn on the six and an electric horn on the four, extension inspection lamp, tool kit, jack, etc. The six is finished in Brewster green, or royal blue body, with black running gear, striped with white, and vermillion wheels, the four in Brewster green or French grey, with black running gear and wheels.



Left side of unit power plant used in the Empire six



Left side of Teetor T-head motor used in new Empire four

Cotton Advance Booms Sales In South

ATLANTA, GA., Oct. 16—The rapid advance in cotton prices has boomed the sales of automobiles in the South. Dealers in this city are at present getting more orders than they can fill. At present there is a large shortage of cars here. Some of the agents are offering bonuses to agents in other sections if they will divide the machines allotted to them.

Business conditions throughout the South are picking up with a consequent demand for cars. Several of the automobile manufacturers are taking advantage of the recent boom and are establishing headquarters in this city.

Automobile agencies in this city report large increases in business over that of 1914. The Buick agency shows an increase of 350 per cent. Reports from the various Buick agencies throughout the South state that they are nearly 1000 cars short on their orders.

Some of the Southern people are preparing to buy pleasure cars who had never thought of such a thing before. Instances are known where people have saved exactly enough money to buy an automobile.

The agency for the Maxwell, Mitchell and National has more orders than it can hope to fill on time. The manager of the concern states that the southern companies are going to have the best automobile year ever known in the history of the South. It is claimed that the action taken by the banks all over the country to remedy the depression of several months ago has had a wonderful effect.

The Cadillac agency is thirty cars behind in orders. Many sales are being made to farmers.

The Haynes company has established headquarters in this city at 239 Peachtree Street as a result of better business conditions.

Maine Spends $6,516,000 for Cars

PORTLAND, ME., Oct. 16—Maine people have spent $6,516,000 for automobiles during the past year, according to Secretary of State J. E. Bunker's estimate. This estimate includes 360 trucks, costing $226,000. Automobile taxes have yielded to the State treasury $258,665, and 24,326 operator licenses have been granted. The receipts for the entire year of 1914 were only $192,000, or $66,665 less than for 1915.

The Rostrum

Loose Connecting-Rod Causes Knock

EDITOR THE AUTOMOBILE:—I have an elusive knock in my Buick six model D-45 which seems to baffle local experts and, as usual, I turn to THE AUTOMOBILE for assistance. The knock has always been present in this car, which has been run 1200 miles, but seems to increase the farther I run it. This noise is not heard at speeds under 25 m.p.h., and is of a metallic nature. Have been over the tappets several times and am satisfied the trouble is not in them. Have not investigated the bearings, but it seems hardly possible to have a loose bearing in a brand new car, although the knock is of that nature.

The noise is not heard with the spark retarded, being present only when fully advanced. I have been told that it is a spark pound and that I must run with a later spark, but this results in reduced efficiency and heating up of the engine, besides being contrary to the instruction book which says to run with spark lever fully advanced on the sector. I have also been told that this noise is characteristic of this car, being caused by the automatic spark advance mechanism, but I fail to see why this centrifugal governor should cause a knock.

I might add in conclusion that there is no difference in the intensity of the knock whether running on the level or ascending a grade, it being present at all speeds above 25 m.p.h. regardless of the position of the throttle.

This knock is very annoying and has resulted in much ridicule being cast upon the car and the driver, and anyone who can locate the trouble and suggest a remedy will earn my everlasting gratitude. D. C. C.

East Canaan, Conn.

—From your description of the symptoms, it seems quite certain that this knock is due to a loose connecting-rod. This can be corrected by removing the lower half of the crankcase, loosening the connecting-rod cap and removing one of the thin metal shims on one side.

New Coil Would Improve Ignition

Editor THE AUTOMOBILE:—I have a 1913 Ford car which jerks a little whenever I run it at the rate of 9 or 10 m.p.h. I was told that such a jerk came from the differential gears because they have too much play. I really do not believe this could be the cause, as the motor pulls well. I do not think the differential should have any effect on the car even if it has much play. I installed a master vibrator because I thought the coils were too weak and once in a while the motor would miss fire. The man who told me about the differential said that there is no use in using the master vibrator, because if the coils are too weak, I should replace them with a new set. Would like your opinion on this. J. T.

Houston, Tex.

—Misfiring of the Ford motor at low engine speeds may be the result of a number of conditions. The most probable causes of the trouble are: Poor compression on account of leaky valves; improperly adjusted carbureter, causing too rich or too lean a mixture; dirty spark plugs; coil vibrators improperly adjusted or points dirty or burned; air leak in intake manifold; weak exhaust valve springs; too great clearance between valve stems and push rods; too small gaps between spark plug points; or, possibly imperfect contact in the commutator.

It is certain that the condition of the rear axle assembly has no effect upon the irregularity of the motor. There is a Ford service station in Houston at which any repairs can be made. The Ford company does not approve of the use of master vibrators, though various ignition companies recommend them. It is certain, however, that if your coils are weak the replacement of your present coil with a new Ford coil would improve your ignition.

Missing Due to Sticking Valves

Editor THE AUTOMOBILE:—The two front cylinders in my car will run for days and weeks without causing any trouble and then, without apparent cause, will cease firing, the cylinders flood with gasoline and the motor will heat up. On these occasions, the plugs give good fat sparks every revolution—I have tried them with a screwdriver—but there is no explosion in the cylinders. What do you think is the trouble, its cause and its remedy? N. R. F.

Mauch Chunk, Pa.

—The trouble with your two front cylinders seems to be sticking valves. The fact that you state that the motor overheats at the same time would lead to the belief that this is a cause and not an effect. The probabilities are that the motor starts to become overheated, causing the valves to stick, which in turn gives rise to misfire. You should look carefully to see that the valve stems have proper clearance, that they are not bent and that the cooling system is clean and in good order. The latter can be aided by flushing out with a saturated solution of common soda.

To Time Four and Magneto

Editor THE AUTOMOBILE:—Kindly let me know the quickest way to time a four-cylinder motor and also the magneto.

Red Bank, N. J. J. P.

—The quickest way to time a four-cylinder motor is to take advantage of the markings on the flywheel. You will note that the point of intake opening and exhaust opening for each cylinder is marked on the flywheel, the mark, for instance, of intake opening No. 1 cylinder being 1.0. No. 1 indicating intake opens for No. 1 cylinder when this mark registers with the mark attached to the engine frame. The camshaft gear and the magneto gear should be taken out of mesh and the flywheel brought around so that this mark registers with the mark on the engine frame or indicator as is sometimes used. The camshaft should then be turned, and when it is in such a position that the function indicated by the flywheel mark is taking place, the camshaft gear should then be slipped into mesh.

In timing the magneto the mark on the flywheel is carried around to upper dead center at which position the spark for that cylinder should be taking place with the magneto set at full retard. The timing of the magneto itself will depend upon the make and model. The armature shaft of the magneto is always arranged so that a spark of maximum intensity is provided at the moment of breaking the circuit in the breaker box. The means for attaining this end varies with

the different makes of magnetos and should be learned from the manufacturer's instructions or will be furnished through the Rostrum if you will give the name and model of the magneto.

Glycerine for Anti-Freeze Solution

Editor THE AUTOMOBILE:—Will you kindly tell me of some practical way to filter cylinder oil to remove the carbon after it has been used in the engine?

2—Are there different grades of glycerine and what grade is best to use in the radiator to form an anti-freezing solution?

Winchester, N. H. H. B. H.

—THE AUTOMOBILE has no record of any practical way to filter cylinder oil to remove the impurities after it has been used in the motor. Some people use this old oil for gears and state that it has proved quite satisfactory.

2—There are several grades of glycerine, depending upon the purity. The C. P. or chemically pure grade should be used in the radiator.

Maximum R.P.M. of Long Stroke

Editor THE AUTOMOBILE:—Is a long-stroke motor capable of turning over faster than a short-stroke?

2—Would a 4½ by 6-in. six-cylinder motor turn faster than a 4½ by 5½ motor of the same design?

3—How fast will the highest speed motor turn? What are the dimensions of one of these?

Beaver Falls, Pa. E. S.

—No, not so fast, limiting speed is piston speed in feet per minute, not revolutions per minute.

2—No, not quite so fast, if of equivalent engineering standard of design.

3—The highest speed motors in commercial use will turn at about 3000 r.p.m. The dimensions would be about 3 in. by 5 in.

Installing Ammeter on 1912 Buick

Editor THE AUTOMOBILE:—Will you please give me instructions through the Rostrum department of THE AUTOMOBILE regarding the proper way of installing an ammeter on a Buick car B-25, 1914 model?

Williamsport, Ohio. C. E. H.

—In order to properly install an ammeter on a B-25, 1914 Buick car it will be necessary to remove the motor generator from the car and take it apart. When the motor generator is taken apart it will be noted that there is a brass strip connecting the larger and smaller terminals on the side of the motor generator frame. This strip of brass must be removed and the motor generator reassembled. Then by attaching one terminal of the ammeter to the larger terminal on the side of the generator frame, and the other terminal of the ammeter to the smaller terminal on the side of the generator frame, the ammeter will be correctly connected except as to its polarity. This can readily be determined and the leads to the ammeter reversed if necessary.

The Delco company recommends that where installations are made, that an ammeter having a zero center and a range of 30 charge and 30 discharge be used. The installation is shown in Fig. 2 as regards the strap connection between the terminals and a wiring diagram is also given in Fig. 1.

Rebuilding 1909 Cadillac for Speed

Editor THE AUTOMOBILE:—I have an 1909 model Cadillac which I am going to convert into a two-passenger raceabout and I would like to have you answer the following questions through the Rostrum columns of THE AUTOMOBILE.

1—Is there any method by which the steering column can be lowered?

2—It has a Bosch magneto and would like to know how often it should be overhauled, and what should be done?

3—Kindly show by drawings, etc., a body with bucket seats, gasoline tank in rear seats, tire carrier, tool box, etc., under rear deck.

4—Offer any suggestions that would tend to increase the speed and what should the speed be with a gear ratio of 3.5 to 1 and 33 by 4 tires? A. T.

Wenatchee, Wash.

—There is no method of lowering the steering column used on the 1909 Cadillac. It is possible, however, that the steering gear used in the 1909 roadster could be placed in this car, and as the roadster steering gear makes a smaller angle with the horizontal than the touring car steering gear, the desired result might be obtained in this manner. This, however, would be considerable work, as it would be necessary to secure an entirely new roadster steering gear as well as making it necessary to secure parts in order to fit the steering post to the front of the car at the point where it passes through the dash. Special brackets are necessary for this purpose, and besides this considerable fitting would probably be necessary.

2—There is no rule by which you can go in the number of times a Bosch magneto has to be overhauled. THE AUTOMOBILE has record of a certain Franklin car which has traveled 150,000 miles without having the magneto touched other than occasionally cleaned. There are a great number of cars

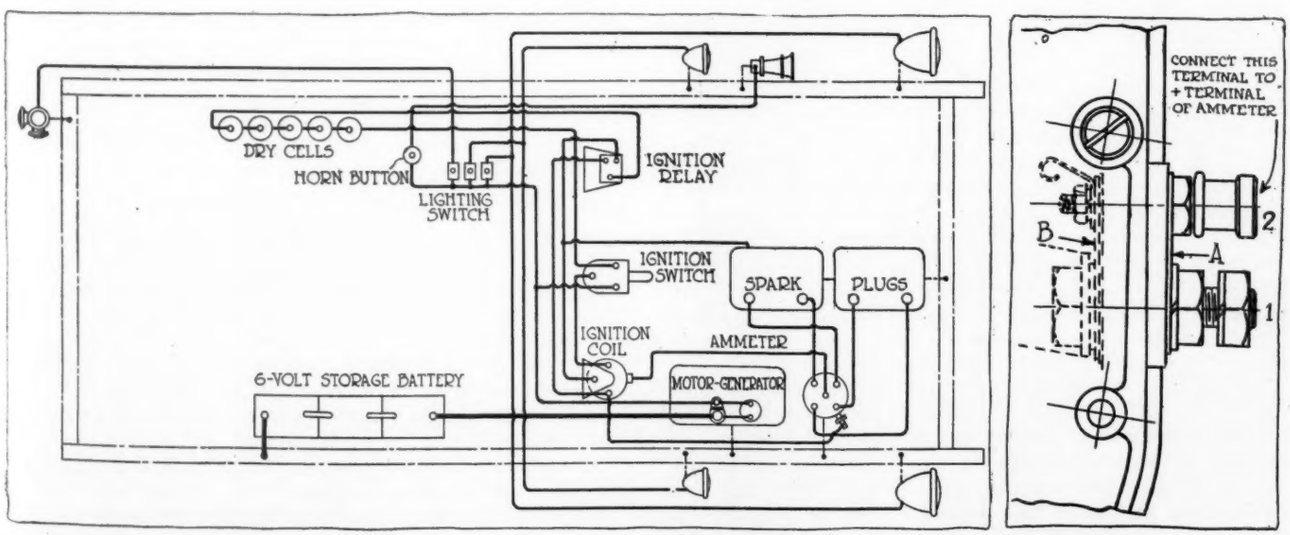


Fig. 1—Wiring diagram and illustration showing the method of fastening ammeter to Buick 1914 model B-25

which have gone five or six seasons without even having the magnets charged.

3—By referring to your file of back copies of THE AUTOMOBILE, you will find a large number of bodies which coincide with the outline you give.

4—As to what speed this car should make with 3.5 to 1 ratio, and 33 to 4 tires, this of course would depend upon the possible r.p.m. of the engine. This is a matter which is rather indefinite and difficult to ascertain on a car of this model. The standard 1909 gear ratio for the touring car was 3½ to 1, and for the roadster 3 to 1. If one is looking entirely for speed, the higher gear ratio should of course be used. The standard tire on this car is 32 by 3½, the effect of putting on 33 by 4 tires is the same as would be obtained by putting on a higher gear ratio; that is, while the ultimate speed is higher, the acceleration is decreased.

Calculating Horsepower of Gears

Editor THE AUTOMOBILE:—Would you kindly supply me with a formula for calculating the horsepower of cast iron and steel gears?

Brooklyn, N. Y. L. H.

—The method for calculating the horsepower which can be safely transmitted by cast iron and steel gears is the same. The following formulae are based upon cast iron and for steel it is only necessary to multiply the result by 2.5:

F = Breadth, or face of tooth in inches.
T = Thickness of tooth at pitch line, inches.
V = Velocity at pitch line in feet per minute.
L = Length of tooth, from root to point, in inches.
C = Co-efficient.
Hp. = Horsepower transmitted with a factor of safety of eight; ultimate tensile strength 30,000 lb. per square inch.

FORMULAE

(1) Horsepower of Spur Gears = $\frac{F \times T2 \times V}{L \times 53}$

(2) Horsepower of Bevel Gears = $\frac{F \times T2 \times V}{L \times 77}$

(3) Horsepower of Miter Gears = $\frac{F \times T2 \times V}{L \times 82}$

(In formulae for bevel and miter gears, the factors T and L express the pitch at large end of tooth.)

For bevel and miters, thickness and length of teeth have been computed at center of face. With a view, however, of facilitating calculation, the proportions of factors T and L in formulae (2) and (3) have been taken at large end of tooth, thus giving same dimensions as for spur gears; hence the spur gear formula has been utilized, with the exception of co-efficient, which has been determined by averaging the proportions of teeth of bevel and miter gears having the largest and smallest number of teeth in general use. The resultant horsepower is consequently less than in the case of spur gears of like pitch.

For mortise wheels and pinions use thickness of pinion tooth. If different margin of safety is desired, multiply above result by 8 and divide by factor of safety desired; 2200 ft. per minute at pitch line for iron gearing and 3000 ft. for wood and iron, are excessive velocities, and should be avoided if possible.

Farm Tractor Field Widens

13,000 in Operation in States West of the Mississippi— 7,000 Is Estimate for East

FARM power, exceeding in extent and cost that for any other purpose, even manufacturing in all branches, is to-day the only great field of power consumption which depends upon animal power in the main. Phillip S. Rose, editor *The American Thresherman* and the *Gas Review*, Madison, Wis., in an address delivered before the International Engineering Congress at San Francisco last September, made the prediction that this giant among power-consuming industries would also adopt mechanical power for the greater part, and that soon.

Mr. Rose points out that the preferred use of horse and mule power by American farmers, in spite of its greater cost per unit of energy, is due to the greater "activity" or versatility of the animal as against the engine. He further states that the 24,042,882 horses on farms in 1910, have grown to 25,411,000 up to Jan. 1, 1915, by estimates of the Department of Agriculture, of which 20,328,800 are mature work animals. Each horse develops 7/10 hp. so that the animal power on farms is estimated by Mr. Rose to aggregate 14,230,000 hp. The value of these horses is $2,842,655,000 and their harness, $203,200,000, a total of $3,045,855,000, or $214.05 per horsepower. He quotes Professor Gebhart of Armour Institute, Chicago, to show that steam power plants cost $200 to $175, the cost varying inversely as the power of the plant.

The number of farm horses has increased from about 7,000,000 in 1870 to about 21,000,000 in 1914, and the acreage worked has increased from 185,000,000 in 1870 to 500,000,000 in 1914, so that though the increase in power available and work to be done has kept approximate step, the actual acreage worked per horse has decreased from 20.3 in 1870 to about 19.2 since 1900. This greater power expended per acre is explained by two things; namely, deeper plowing and scarcity and rising cost of farm labor. The draft on a plow in ordinary soil increases about in proportion with the depth of the furrow in inches, so that deeper plowing, which all authorities indorse, requires more power. The scarcity and dearness of farm labor has given rise to heavier machines, such as gang plows, combined harrows and grain drills, larger harvesters, etc., so that each unit of labor is able to compass a greater amount of work per day or so that each farm requires a smaller number of hands.

This has led to the breeding of heavier and heavier draft animals for the farm until the limit has about been reached. Further development along the above lines requires that the horse with his limitations be discarded and the limitless power of the internal combustion engine employed in his stead. Concerning this, Mr. Rose says:

Mechanical Farm Power

"Available mechanical farm power consists of steam engines, internal combustion engines, wind mills and water power. Electric power, generated either by steam plants or hydro-electric stations, is used to a limited extent in some favored localities, as along the Pacific seaboard, in Montana and in some of the Central States, but, as yet, it has not come into serious competition with any of the other powers.

"Small water-power plants are available in only a few favored localities, and then the cost of the dam and power equipment is exceedingly high, so this kind of power may be left out of general consideration.

"The use of windmills has been on the decline for a number of years. The principal objection to their use is the

smallness of the power units and the uncertainty of obtaining power when needed.

"This, then, leaves only two sources of power for serious consideration, namely the steam, gas or oil engine. The former has been in use in this country since about the year 1830. Steam did not come into very extensive use until after the Civil War, and then only for operating threshing machines, running small saw-mills and for grinding feed. Experiments were made in this country, along in the seventies and eighties of the last century, with steam plowing outfits but not with much success, either because the engines were not designed rigidly enough, or because the country was too poor to invest in such costly machines. Probably both causes had an influence on the situation.

"About the year 1898, however, when the Western prairies were being opened up so rapidly, a demand arose for heavy power outfits to break up the virgin sod and within the next five years a number of excellent steam rigs were put on the market. Practically every threshing outfit sold throughout the West in the early nineties was sold not only for threshing but for plowing also. Thousands of acres were broken by these rigs, but their great weight and the difficulty of getting water to them on the dry Western plains created a demand for something different and better.

The Gas Tractor Appears

"It was these conditions, together with the rising price of horses, that paved the way for the gas tractor. The first of these machines came out about the year 1900, but it was not until six years later that they became practical machines. Two companies divide the honor of being the pioneers in this new industry, the Hart-Parr Co. of Charles City, Iowa and the Kinnard-Haines Co., Minneapolis, Minn. The success of these machines brought into the field a host of competitors among the old threshing machine manufacturers, and by 1912 the tractor industry had grown to considerable proportions. That was the banner year. It was freely predicted by many enthusiasts that the horse was doomed and that in a very short time all farm work would be done with tractors. They practically crowded the steam plowing outfits off the market and thousands of farmers bought them.

"A considerable number succeeded with the tractor, but a larger number failed. In some cases, the cause of failure was due to the failure of the machine, but in the majority of cases it was due either to the ignorance of the operator or to the fact that his style of farming was not adapted to power machinery. It was also found that the heavy outfits that were used to break up the prairies were not adapted to general field work, and so the industry has suffered a partial collapse during the last two years. Another factor that contributed to the general slump in business was the faulty methods employed by most of the companies in doing business. The market was not well sold. Farmers were induced to buy, who could not possibly make a success with a tractor, and there was not enough care given to the instruction of the operators. The tractor has suffered in comparison with the automobile because the latter has had the help of countless garages to help keep them in good working order. The tractor, on the other hand, has had to get along generally without any expert attention. Invariably, those who have made a success have been good mechanics. In fact, failures among mechanics or those of fair mechanical ability have been rare.

Demand for Light Type

"At the present time there is a decided revival in the use of the light-weight tractor that sells for a few hundred dollars and will take the place of a half dozen horses. There are perhaps fifty companies that will bring out a light-weight tractor this spring in response to a demand by the farmers of the corn belt and wheat belts. This demand is not one that has been worked up by ingenious and persistent advertising but comes from the farmers themselves, who realize the limitations of animal power and who desire to do a better grade of farming than they have done in the past. Just how the light-weight tractor will develop is difficult to forecast at this time, but where such a genuine need exists there seems little doubt that the manufacturers who have had a number of years' experience will be able to produce a machine that will be able to supplement the horse and the mule, even if it does not displace them. The present tendency toward very light machines, weighing only 3000 or 4000 lb., probably marks the extreme swing of the pendulum toward light weight. The tractor that appears, to the writer, to have the best chance for ultimate success will weigh from 6000 to 8000 lb., and have about a 30-hp motor.

"A careful canvass of the States west of the Mississippi made last winter by A. P. Yerkes, a government agent connected with the Bureau of Farm Management of the United States Department of Agriculture, shows that there are something like 13,000 tractors in operation. There are probably not to exceed one-quarter as many east of the river, making something less than 20,000 tractors in use in the entire country. These tractors vary greatly in size, but will doubtless average close to 40 brake horsepower each.

"The possibilities for the use of tractors are, however, almost unlimited when the number of farms of large size containing 175 acres or more, is considered. Each one of these farms would appear to be large enough to make profitable use of some form of mechanical power for general farm use, provided one can be built and sold for a price at which the farmer can afford to make the investment.

"Steam traction engines are still used as the principal source of power for threshing, and it does not seem likely that they will be displaced entirely for a great many years. From the best information available, which, by the way, the writer has checked over in several ways, it is estimated that there are a total of close to 100,000 steam tractors in this country used for threshing and other agricultural work. The average brake horsepower of these machines is probably about 40. Quite a large number are used for plowing, for filling silos, grading roads, grinding feed, shredding and husking corn and for operating small portable saw-mills.

Automobiles Fill a Mission

"There is still left the automobile and the farm truck to consider. The latter is used very little, but of the former the number is very large, running into hundreds of thousands. In the State of Iowa alone it is estimated that there are 65,000 automobiles owned by farmers, and a number of other States are not much behind. Since these are primarily passenger machines rather than farm power machines, I shall not spend much time with their consideration. Suffice it merely to say that they are finding a rapidly increasing use in marketing light farm produce and paving the way for better roads and for the use of trucks.

"I said in the beginning that farm power exceeds in value and amount that is used in all manufacturing industries. The proof has been submitted, but to make it more apparent let us tabulate the results:

Kind of Power	Number	Average Value	Total Value	Total Power
Horses and mules	25,411,000	$111.85	$2,842,655,000	14,230,000
Harnesses	20,382,000	10.00	203,820,000	.....
Windmills	750,000	100.00	75,000,000	75,000
Steam tractors	100,000	.....	.....	4,000,000
Gas tractors	20,000	2,000.00	40,000,000	600,000
Gas engines	1,000,000	150.00	150,000,000	5,000,000
			$3,311,475,000	23,905,000

"The total power used in all manufacturing enterprises, according to the 1910 census, was 18,755,286 hp. Even allowing a large margin for possible error, it is thus seen that the farmer's power problem is a big one and involves millions of dollars. Mechanical power, as yet, is much smaller in amount than animal power, but it is rapidly increasing and within a few years will doubtless assume first place."

ACCESSORIES

New-Speed Carbureter

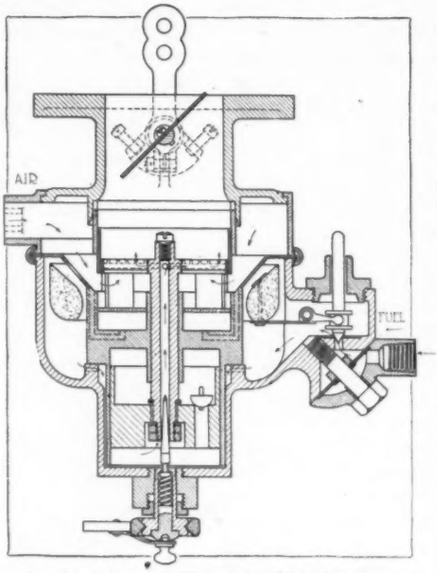
ALTHOUGH named the New-Speed carbureter this instrument is intended for all speeds, but takes its appellation from James Speed, its inventor. This is an automatic design and, as will be seen from the section, is controlled by a floating air valve which is raised by the suction of the motor. This valve, which the makers have called the elevator, is located in the neck of the carbureter and has ports cut in the sides, which correspond with ports in the passage in which the elevator travels.

Under normal conditions when the motor is idling the elevator is in its lowest position which closes all ports and only allows fuel to enter through a simple passage. Cross-wise in the top of the elevator is placed a row of jets which are designed to take care of the diffusion of the fuel.

There is also a piston placed in a separate compartment in the center of the float chamber directly beneath the fuel elevator, and attached thereto by a fuel stem. The piston being attached to the fuel elevator travels at the same distance as the latter and is of sufficient weight to insure proper balance and proper closing of the fuel elevator. It is through this fuel stem that the gasoline travels to the row of jets in the top of the elevator.

The amount of fuel flow is governed by a metering pin mounted vertically upward beneath the fuel stem. As the elevator rises, carrying with it the stem, the taper in the pin governs the amount of fuel admitted. The greater the suction the higher the floating valve lift, and therefore, the greater the amount of fuel and air. Since the meters are all straight tapers, it is only necessary to put the right taper pin for a given motor and to adjust it properly for idling. After this it will be automatically correct for every other speed.

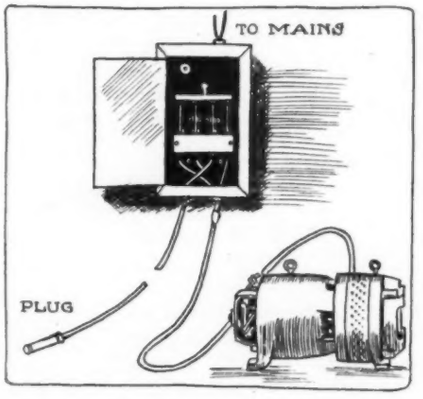
The combination dirt and water strainer is placed in the gasoline intake adjustment. There is no float adjustment as this is correctly placed at the factory. Prices vary from $20 for the ¾-in. size to $45 for the 2-in.—New-Speed Carbureter Co., San Francisco, Cal.



Section through New-Speed carbureter

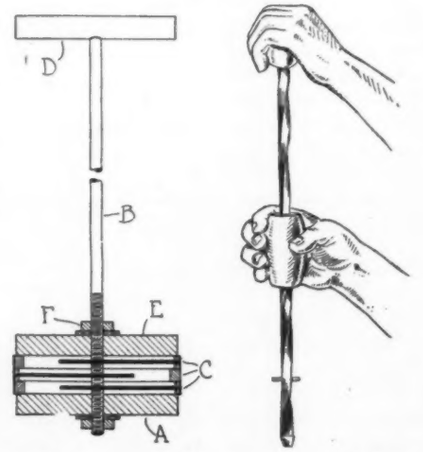
Milburn Light Electric Charger

A charging apparatus which any owner can use to charge the battery of his electric passenger car is now out under the name of the Milburn Light Electric Charger. It is designed especially to meet the needs of persons who desire to take care of their own batteries. With it the electric car owner need only turn the main switch in the car to charge position, insert the charging plug in its receptacle and close the switch in the wall panel provided with the apparatus.



Milburn light electric charger showing connections

The machine consists of a compound-wound-direct-current generator direct connected to a standard single-phase squirrel cage induction motor. The squirrel cage motor is non-self-starting and the outfit depends upon starting from the direct-current end. This is accomplished by a four-pole switch, the two middle prongs of which stick up higher than the others. After the switch is thrown in slowly, the shunt field is excited and then the armature of the direct current is thrown directly across the battery. The set then begins to revolve, the generator acting as a shunt motor, the series field being cut out by means of the clip. As the switch is thrown into the last step the alternating current is thrown onto the motor and the outfit starts to charge the battery. Being compound-wound, the outfit approaches a constant potential method of charging, the charge starting at a high rate and slowly tapering to a low finishing rate. This gives a charge which is non-gassing and will very materially increase the life of the battery. The outfit is made two-bearing, ball bearing so that all difficulties from bearing trouble are eliminated. The price varies from 110 or 220 volts, 60 cycle, $130, to 25 cycle, $140.—Lincoln Electric Co., Cleveland, Ohio.



Left—Peerless piston ring lapping tool for fitting new rings to worn or oval cylinders. Right—Michener valve grinding tool

Stevens Countersinks

This set of countersinks for fitting brake and clutch linings consists of 9/16, ½ and 13/32 in. countersinks for Nos. 7 to 11, inclusive, flat head rivets having countersunk heads as well as for all sizes of similar rivets. As the shank of the countersinks is 5/16 in. in diameter, they can be used in a hand drill or power press. These tools are said to cut a clean and accurate hole very rapidly. The set sells for $1, but single sizes can be obtained.

For garage and repair shop stocking the Stevens company is producing boxed assortments of iron and brass wood screws, machine screws with nuts, iron bolts and copper rivets with burrs. No. 10 assortment consists of the above named packed in a strong cardboard box. —Stevens & Co., New York City.

Peerless Lapping Tool

For fitting new piston rings to worn or oval cylinders the Peerless piston ring lapping tool has been brought out, to avoid running the car 100 to 1000 miles in order to lap in the rings with inferior results. The lapping tool comprises a handle, connecting-rod and disks

and nuts for holding the piston rings in position while lapping.

To lap in the piston rings, referring to the illustration, place the lower disk *A* with rod *B* in the cylinder. The rings *C* are slipped over the handle *D* on to the disk in the same position in the cylinder as they are to be used in the piston. The pins are then inserted and the upper slotted disk *E* is placed in position and held firmly by the clamping nut *F* which is lightly turned into position. The cylinder is then charged with piston ring lapping compound and about twenty-five strokes are made with the handle *D* or until the rings are lapped to fit the cylinders. The Peerless lapping tool for any size costs 50 cents. The extra disks per pair are 25 cents and the piston ring lapping compound is 25 cents.—Peerless Piston Ring Co., Newark, N. J.

Michener Valve Grinder

This tool consists of a steel shank with a spiral twist on which works an aluminum handle; moving the handle up and down causes the shank to turn first in one direction and then the other. At the top is a ball handle, of wood, with an anti-friction bearing, and at the other end a blade like that of a screwdriver to enter the slot in the valve head. Price, $1.50—E. S. Michener, New Castle, Pa.

Q. D. Tank Body

For quick oil transportation and for use with gasoline delivery wagons there has been put on the market a device known as the Q. D. or quick-delivery gasoline tank body for Ford cars. Oil companies whose service requires rapid delivery must provide a method of transportation of gasoline and oil which will quickly carry a supply to customers in emergency. This outfit is particularly designed to meet that requirement. A 100-gal. tank with extra cans of lubricating oil when required, as illustrated, provide a suitable load for the Ford car.

The tank complete can be attached the first time in about 2 hr., after that it requires not more than 5 min. to attach or detach it, thus providing a double-purpose car. The outfit is supplied with faucets, air vent, etc., and is used with or without box for measures, funnels, etc.—Ohio Welding & Mfg. Co., Cincinnati, Ohio.

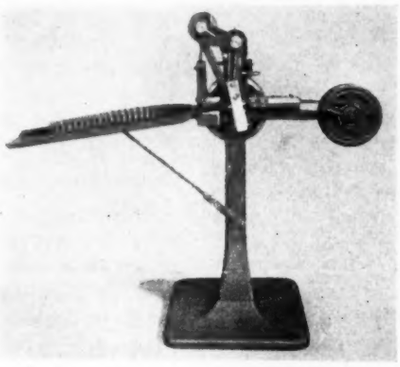
Automatic Radiator Machine

Two automatic machines which have recently been shipped to the Coventry Motor Fittings Co. of Coventry, England, which are suitable for radiator manufacture, are illustrated herewith. The tube drawing machine will form tubing or molding in any desired shape from flat ribbon material. It will draw the tubing with plain or lock seam and is capable of drawing enough tube to make 200 automobile radiators a day.

The other machine is an automatic self-feeding punch press, taking the place of an ordinary press with roll feed, and, according to the manufacturer, is faster and more accurate than the latter. The machine is adapted to the manufacture of radiator fins, folding over the edge, perforating and cutting off, all in one operation. The self-feeding press will make enough fins or plates for fifty radiators a day.—F. H. Stolp, Geneva, N. Y.

Magnalite alloy pistons. Note ribbing

Q. D. gasoline delivery tank for Fords



Stolp radiator fin punch press

No-Glare Nitrogen Bulbs

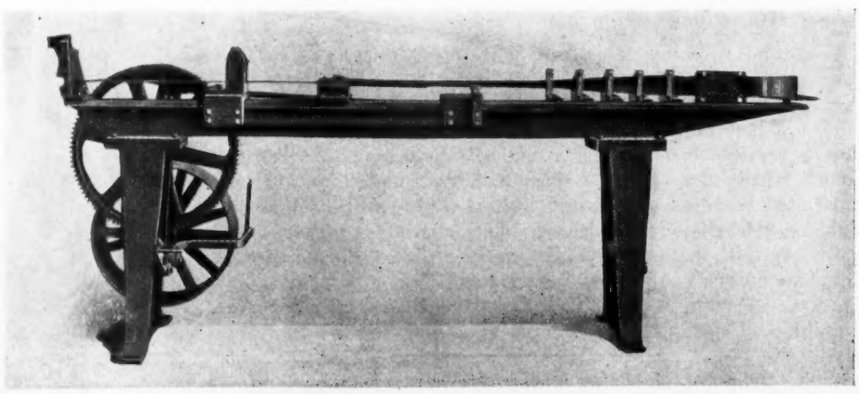
Opalescent nitrogen-filled bulbs are manufactured in 32-cp. and voltages to suit the various standard systems in use. The makers state that the lamp has been adopted by the States of New Jersey and Maryland and that it conforms with the anti-glare regulations of other States. Long life and high efficiency are claimed. Price, $1.—Vosburg Miniature Lamp Co., West Orange, N. J.

Maluminum for Parts

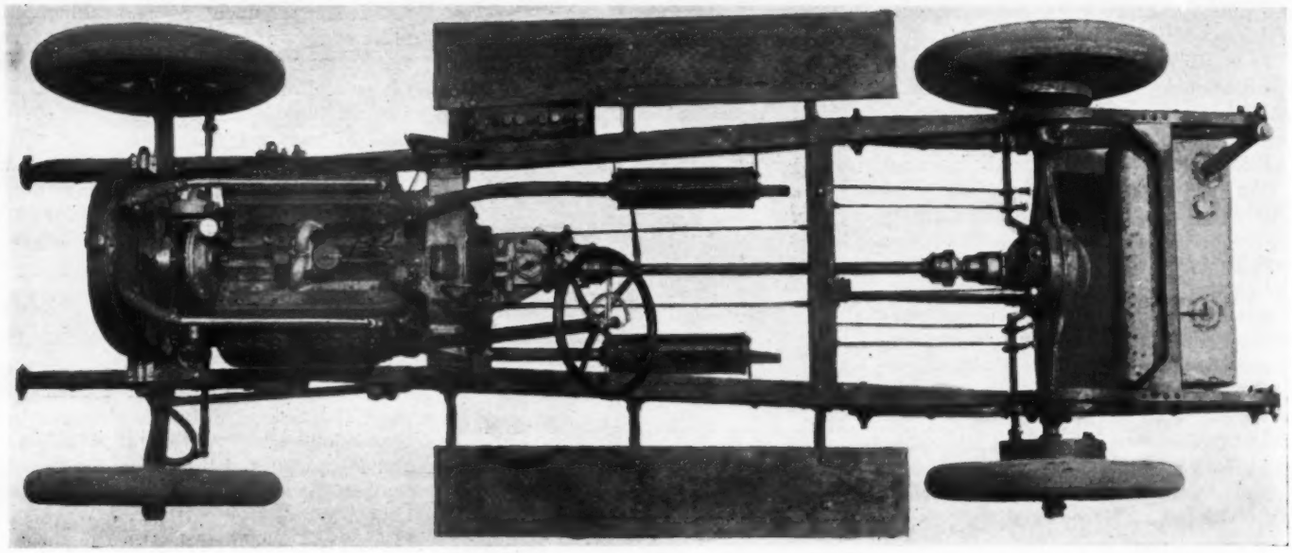
A malleable form of aluminum, called Maluminum has been developed for making car parts which must be light and strong. It is used for body molding, gearboxes, radiator frames, etc., and, according to the manufacturer, shows a tensile strength of 17,500 to 20,000 lb. per sq. in., and an elastic limit of about 16,000 lb. The metal is slightly heavier than some aluminum alloys now in use, but has the advantage that it is malleable, can be die cast and can be riveted in machine operations. It is also claimed that the metal is capable of taking a high polish.—Pioneer Brass Works, Indianapolis, Ind.

Grobet Spark Plug File

This file is designed especially to smooth the contact points of magnetos, coils and other ignition apparatus. It is claimed to cut smoothly without ripping or roughening the metal and without wasting platinum. The end of the file has a screwdriver point, the handle being round. The total length is 6 in., while the file surface is 3 in. long. The files sell for 15 cents each.—Montgomery & Co., New York City.



Stolp tube drawing machine for use in the manufacture of tubing for automobile radiators



Daniels eight chassis, showing mounting of unit power plant. Note twin exhaust manifolds and separate muffler for each cylinder block

Daniels Eight of Strong Construction

Uses Herschell-Spillman 3 1-4 by 5-In. Motor—Distinctive Body

AMPLE power is a characteristic of the Daniels eight, made by the Daniels Motor Car Co., Reading, Pa., which uses a 3¼ by 5-in. L-head Herschell-Spillman motor with Brown-Lipe gearbox in a unit power plant. The cylinders are cast in two blocks of four each with the inlet pipes integral and the exhaust pipes bolted on, the crankcase being an aluminum casting with the oil reservoir in the lower half; separate for easy accessibility. The valves are operated from a single camshaft with sixteen integral cams, or one for each valve. By staggering the cylinder blocks a distance equal to the width of the connecting-rod crankshaft bearing, the use of forked connecting-rod ends and of double concentric crankpin bearings is rendered unnecessary. The connecting-rods work side by side on crankpins and are interchangeable, being I-section drop forgings of two-bolt cap construction. The flywheel is of semi-steel with a machined steel starting gear ring bolted on. The formula rating of the motor is 37 hp. Twin exhaust lines and mufflers are employed.

Force-Feed Oiling

Lubrication is by force-feed, with regulation by a safety valve which discharges excess pressure of oil on the spiral gears in front that drive the camshaft and fan. Within the crankcase sump is located a geared oil pump which is driven by a vertical inclosed shaft and spiral gears. The crankshaft is drilled with oil passages and the connecting-rods are provided with oil pipes which permit the oil to be forced to the crankshaft, connecting-rod and piston-pin bearings. A Mayo cellular radiator is used for cooling in conjunction with duplex centrifugal pumps.

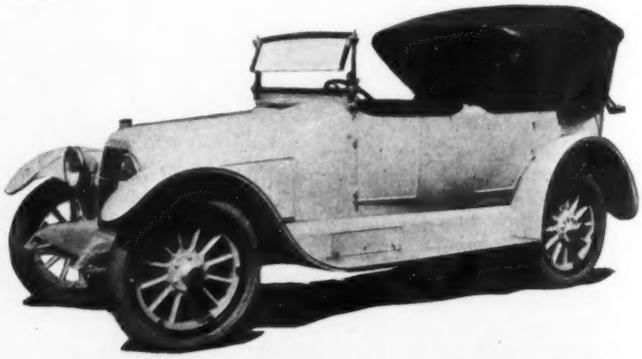
A 1¼-in. duplex Zenith carbureter is used with hot air intake and dash control for the strangler valve. Ignition is by the Westinghouse system in connection with a Willard 6-volt, 100 amp.-hr. battery, the interrupter being so constructed that the period of contact is practically the same at all speeds. The Westinghouse starter is also a feature in conjunction with a Bendix gear. The Westinghouse 6-volt generator for lighting and battery charging is driven by a cross shaft and spiral gears at the front of the motor. A vacuum fuel feed system is employed, the main tank having a capacity of 20 gal.

The three-speed Brown-Lipe gearset is secured to the motor by a bell housing, a multiple-disk, dry-plate clutch operating on ball bearings being used. The propeller shaft is equipped with a double universal designed to eliminate whip at highest speed. Drive is taken through the rear springs and torque through a torsion arm. Alloy steel, semi-elliptic springs are used, the rear ones being 2½-in. wide and slung under the axle.

Three-Quarter Floating Axle

A three-quarter floating rear axle is used, the shaft itself being of large diameter and the housing of pressed steel, other features of its construction being tapered roller bearings and spiral bevel gears. Brakes are of the conventional internal-expanding and external-contracting type, the drums being 15 in. in diameter.

Streamline design characterizes the body which has a double cowl finished with a heavy mahogany garnish around the top. Battery and tool boxes are set in the sides of the splash shields. With complete equipment the car sells for $2,350.



Daniels eight, seven-passenger touring car listing at $2,350

The Automobile

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The Mid-West Section

BY organizing a Mid-West section of the Society of Automobile Engineers, which will embrace not only Chicago but such Mid-West cities as Milwaukee with more than fifty-seven members of the society, Moline, Davenport, Rock Island, Kenosha, Racine, Peoria, Aurora, Rockford, Whiting, Ind., the great gasoline center, and Gary, Indiana Harbor, South Chicago and Waukegan, the great steel centers, a broader scope has been given to the society, which will unquestionably prove of peculiar value within the next year or so. By christening it the Mid-West section this latest baby has set a new example in section organization, and has demonstrated how it will be possible to extend the influence of the society and make it more of a living organism in places too small to support a section, than it has been heretofore.

The big, broad gage conceptions of Chicago and the Middle West are ideally set forth in this new thought, and instead of holding all of the meetings in Chicago, by holding some in Milwaukee and perhaps others in Racine or Kenosha, it will be possible to open new vistas of opportunity. Essentially the Mid-West section is going to make practical meetings and demonstrations a major part of its program. It will be disappointing if the "I Will" spirit of the Middle West does not achieve marked success in this new phase of section policy.

The Front Fender Fallacy

NEW YORK CITY is being introduced to a front-wheel fender campaign for motor trucks and automobiles in which it is apparently pre-supposed by many of the city officials that the front-wheel fender on trucks and passenger cars is going to eliminate accidents, whereas statistics show that the front-wheel fender is not so great a necessity as the rear-wheel guard or fender. More pedestrians are run over with the rear wheels than by front ones, many of these accidents being due to pedestrians walking into the side of vehicles, the fault resting with the pedestrian rather than the truck.

It is doubtful if the front-wheel fender would be of any value to prevent pedestrians being run over by the front wheels because coroner reports from some of our largest cities show that where pedestrians are struck by the front end of a truck or passenger car that death generally results from concussion of the brain due to the force of striking the pavement, and that quite frequently the wheels do not pass over the victim.

Exports 5 Per Cent

AUTOMOBILE securities should not be classed as war stocks. The remarkable increases in value of some of them are not due to any great war business, but to general prosperity at home. Whereas, Bethlehem steel is strictly a war stock, General Motors, which has had nearly as sensational a rise, is not a war stock, for the company has not sold a single dollar's worth of war material from any of its plants in this country; according to an authoritative statement.

The enormous automobile business now being enjoyed is not due to the war. For the fiscal year ending with June of this year, the country had produced automobiles and trucks to the value of $525,000,000. During that time the records show that some $60,000,000 of automobiles and trucks were exported. This means that only about 10 per cent of the total business done in automobiles in this country was on an export basis. More than half these exports of gasoline vehicles were trucks, so that the quantity of passenger cars sent out of the country was not over 5 per cent.

Electric Progress

THE convention of electrical men interested in all angles of electric vehicle usage again shows, if indeed such demonstration were needed, that the electric field has much room for development. The electric taxicab has many points of advantage and Detroit's example may reasonably be followed by other cities. That electric vehicles have never been popular in European towns is due mainly to lack of interest on the part of central station men. In America better storage batteries, better vehicles and improved charging facilities are consolidating the electric's position and guaranteeing its permanence as a factor in national life.

Huff Chief Engineer for Dodge

Next President of S.A.E. Had Been With Packard Since Early Days

DETROIT, MICH., Oct. 19—Beginning Nov. 1, Russell Huff, consulting engineer of the Packard Motor Car Co. becomes chief engineer of Dodge Brothers. Almost from the time the first Packard car was brought out, Huff has been connected with Packard development. He was the right-hand man, from the engineering end, of S. J. W. Packard, when the latter was making his first cars in Warren, Ohio, about 1900. Ever since he has been one of the big engineers, not only of the Packard organization, but of the country. He is to be the next President of the Society of Automobile Engineers.

Biddle Co. Enters Field

PHILADELPHIA, PA., Oct. 18—The Biddle Motor Car Co., which has been newly formed, is preparing to place on the market a line of four cars, two of which are now ready. These are a touring car to sell for $1,880 and a roadster at $1,700. The third will be a town car, to sell at $3,000, and the fourth a car of the same type and equipped with a Duesenberg motor. The present chassis is designated series D and is equipped with a three-point suspended Buda unit power plant, with four cylinders, 3¾ by 5⅛. Ignition, lighting and starting are Westinghouse and fuel is fed from a Stewart vacuum tank. The wheelbase is 120 in. and tires are 32 by 4.

Phelps Dodge Advertising Director

DETROIT, MICH., Oct. 19—George H. Phelps who has been assistant to George C. Hubbs, assistant general sales manager of Dodge Bros. has been appointed director of advertising. He will have charge of all matters concerning the advertising department and also of sales promotion work.

Davenport Off for Europe

DETROIT, MICH., Oct. 16—E. W. Davenport, export manager of the Maxwell Motor Co. is en route for Europe to look after Maxwell business in Great Britain and on the continent.

Lee Counselman Re-enters Field

DETROIT, MICH., Oct. 18—After nearly one year of retirement from activities, Lee Counselman, who in November, 1914, retired from the Chalmers Motor Co. as first vice-president and general manager of the company, has now re-entered the active world and has become associated with J. T. H. Mitchell, Inc., advertising agents, with offices in New York and Chicago. He will be with the Eastern headquarters, which are at 8 West Fortieth Street, New York.

Mr. Counselman, is well known in the industrial world, and more particularly in the automobile industry, having been connected for seven years with the Chalmers Motor Co.

Paul Smith Chalmers V.-P.

DETROIT, MICH., Oct. 15—The board of directors of the Chalmers Motor Co. to-day elected Paul Smith one of the vice-presidents of the company, to fill the vacancy left through the retirement from the concern of Lee E. Olwell.

Mr. Smith has been with the Chalmers company since last June, when he joined in the capacity of sales manager and was also given charge of the service department. He was formerly sales manager of the old E-M-F and Lozier companies, and last year started in business for himself on the Pacific Coast.

Harrison Resigns from Chalmers

DETROIT, MICH., Oct. 14—H. R. Harrison has resigned as advertising manager of the Chalmers Motor Co. and has been succeeded by Gail Murphy, formerly with the Art Metal Construction Co., Jamestown, N. Y.

$2,200,972 in Cars and Trucks Shipped First Week of October

NEW YORK CITY, Oct. 20—Heavy increases in the shipments of automobiles and trucks to European ports are shown in a detailed comparative statement showing the values of the respective commodities shipped out of the port of New York for the week ending Oct. 9, 1915, issued yesterday by the foreign trade department of the National City Bank. The statement shows that the total shipment of cars and trucks was over thirteen times that made in the same week of 1914, the respective figures being $2,200,972 against $161,174. The 1915 figure consists of $1,017,647 in passenger cars and $1,183,325 in trucks.

The greater part of these shipments were destined to English ports, with France second in order and Italy third.

Scripps-Booth Price Unchanged

DETROIT, MICH., Oct. 18—In an announcement just made by the Scripps-Booth Co., manufacturers of the Scripps-Booth roadster, it is stated that there will be no reduction in price for 1916.

Car Factory for Rochester

CINCINNATI, OHIO, Oct. 16—A new automobile company, being formed by Harry C. Ebert, formerly with the Cincinnati Car Co., and a group of local capitalists, will build a factory at Rochester, N. Y.

Importers' Salon Jan. 3-9

Number of Exhibitors at Hotel Astor Expected To Be as Large as Last Year

NEW YORK CITY, Oct. 20—The Automobile Salon in which several makes of foreign-made cars will be put on exhibition, will be held Jan. 3-9 in the Grand Ball Room of the Hotel Astor as heretofore.

The 1916 Salon will be conducted as usual by the Automobile Importers' Alliance, of which E. Lascaris is president; T. E. Adams, vice-president, and S. J. Kjeldsen, secretary. Mr. Kjeldsen will again manage this exhibition.

It is expected that the number of exhibitors will be on a par with last year's event which had nine foreign car manufacturers, three body builders, three tire makers and two American car makers. Allotment of space will be made in about ten days.

To Build Gersix Truck

PORTLAND, ORE., Oct. 18—The Gersix Co. which is headed by Edward E. Gerlinger, and which will produce an assembled truck rated at 2½ tons capacity and selling for $2,500, has secured a lease on the building formerly occupied by the Pierce-Arrow dealer, a two-story brick structure at East Third and Oregon Streets. A feature of the truck will be a six-cylinder Buda motor. It is stated that during the past week, orders for equipment totalling $175,000 and including 100 sets of Westinghouse starting and lighting apparatus, 100 Buda motors and a quantity of Sheldon worm gears and axles have been placed. In addition to assembling trucks, the company will also rebuild and sell used trucks.

Larrabee-Deyo to Build Two-Ton Trucks

BINGHAMTON, N. Y., Oct. 15—A new concern known as the Larrabee-Deyo Motor Truck Co., has been incorporated in this city with a capital of $80,000 for the manufacture of 2-ton trucks. This company is practically a re-incorporation of the Sturtevant-Larrabee Co., which has made wagons and sleighs in this city for the past forty years. The manufacture of the trucks will start at once.

Brown Joins Perfection Spring

DETROIT, MICH., Oct. 15—Ralph Brown, who was chief engineer of the Keeton Motor Car Co., and also the American Voiturette Co., later joining the engineering force of the Hupp Motor Car Co., is now a member of the engineering force of the Perfection Spring Co.

Page New Departure President

Elected by Directors to Succeed A. F. Rockwell, Founder of Company

BRISTOL, CONN., Oct. 19—*Special Telegram*—DeWitt Page was elected president of the New Departure Mfg. Co. of this city as successor to Albert F. Rockwell, founder of the concern, at a meeting of the board of directors held here late this afternoon. Mr. Rockwell retains his interest in the company but retires from its active management.

—

Houghton Enters Truck Field

MARION, OHIO, Oct. 16—The Houghton Sulky Co., this city, announces that it will start building 1-ton trucks, which will be designed principally for delivery purposes. It is to be known as the Houghton truck and the first of the trucks will be on the market about the first of the year. L. R. Wottering is the engineer in charge of the designing department.

The truck will be equipped with a four-cylinder motor developing 22 hp. It will have three speeds forward and a floating rear axle especially constructed to take care of overloads. The wheelbase will be longer than on most light trucks.

—

Republic Rubber Makes Changes

YOUNGSTOWN, OHIO, Oct. 15—As a result of certain changes recently effective in the working organization of the Republic Rubber Co., L. T. Peterson, first vice-president of the company, takes charge of all factory operation; A. H. Harris will occupy the position of manager of works and W. D. Morris takes charge of all tire departments.

During the month of September the company's output of tires exceeded by more than three times its similar output during September of last year. The output of this department during each of the three preceding months was more than double what it was during the same months of 1914. The production during October, up to this date, has exceeded anything in the history of the company.

—

Adult Must Accompany Child Driver

MADISON, WIS., Oct. 16—Accompanied by an adult person, whether or not such adult is competent to run an automobile, a sixteen-year-old boy or girl, or one younger, may run an automobile on the public highways of this State, according to an opinion recently given by Attorney General Owen to District Attorney G. H. Putman of Waupaca county.

The question arose over interpretation of the law which provides that no person under sixteen years of age, unaccompanied by guardian or other adult person, shall be permitted to ride or drive an automobile upon the public highways.

Attorney General Owen says there can be no other construction than that intended by the Legislature. The presence of an adult person, he states, would act as a deterrent of reckless driving or speeding and that it makes no difference who the adult person is or what his or her ability to drive an automobile.

—

Klingensmith Succeeds Couzens Nov. 1

DETROIT, MICH., Oct. 14—Frank L. Klingensmith, will, beginning Nov. 1, occupy the chair left vacant by the withdrawal from the Ford Motor Co. of James Couzens, who, as was reported briefly in last week's issue of THE AUTOMOBILE was vice-president, treasurer and general manager of the Ford Motor Co.

Mr. Klingensmith is at present secretary of the company. This position he will relinquish and Henry Ford's son, Edsel B, a young man of less than 24, will become secretary of one of the biggest and most prosperous industrial organizations in the world.

It might be added that about twelve or fourteen years ago Mr. Klingensmith was receiving $10 or $12 a week.

—

Couzens Out of Canadian Ford

FORD, ONT., Oct. 15—The resignation of James Couzens as vice-president of the Ford Motor Co., Detroit, also means his retirement from the Ford Motor Co. of Canada, Ltd., of which he was also vice-president. He has been succeeded by Gordon M. McGregor, who has been secretary, treasurer and general manager of the company and who will continue to act as treasurer and general manager, while assistant manager W. R. Campbell has been promoted secretary.

—

To Abolish Wheel Tax

LINCOLN, ILL., Oct. 16—Lincoln will shortly abolish the offensive wheel tax which requires all automobile owners to pay a city tax as well as one to the State. The city council this week received a petition with 1000 names, asking that the ordinance be repealed and as the sentiment is so strong in this direction, the council will act in accordance.

—

Sterling Auto Mfg. Co. to Exhibit

NEW YORK CITY, Oct. 18—In the list of exhibitors for the New York and Chicago shows appearing in THE AUTOMOBILE last week appears the name of the Sterling Motor Car Co., Brockton, Mass. This should have been the Sterling Auto Mfg. Co., New York City.

Stutz Quits Racing Indefinitely

Retires After 5 Years of Successful Competition on Road and Track

INDIANAPOLIS, IND., Oct. 17—After five years in road and track races, the Stutz Motor Car Co. has announced through its President Harry C. Stutz that it will quit the racing game indefinitely. In an interview Mr. Stutz stated that the company may quit for six months and then again it may be out of the game six years, or forever, depending on future developments.

—

Burman in Blitzen Benz to Try for Records at Sheepshead

NEW YORK CITY, Oct. 15—Harry S. Harkness has bought the Blitzen Benz from S. A. Fletcher of Indianapolis. Bob Burman, its driver in the Ormond Beach record trials, will pilot it at the Sheepshead Bay Speedway on Election Day, where he will attempt to set up new records for a circular course.

—

Ward Special Averages 70 Miles Daily

CLEVELAND, OHIO, Oct. 15—The Ward Special which left the New York Electrical Show at its opening bound for this city, arrived here to-night. The distance traveled between New York and Dunkirk was 554.6 miles, a daily average of almost 70 miles. Erie was reached Thursday night and the noon stop yesterday was made at Ashtabula, where the battery was given an hour's boost.

—

Atlas Forge to Add

LANSING, MICH., Oct. 16—The plant of the Atlas Drop Forge Co. is to be considerably enlarged, the stockholders having approved a contemplated expenditure of $40,000 to $50,000 to that effect. The present force of 140 men is to be doubled. At a recent meeting of the stockholders a 10 per cent cash dividend on the company's capital stock of $200,000 was declared.

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Puritan Machine Gets Owen

DETROIT, MICH., Oct. 18—The Puritan Machine Co., which recently purchased the stock and parts of the Havers Motor Car Co., Port Huron, has just taken over the stock, and parts of the Owen Motor Car Co.

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Splitdorf Gets Foreign Contracts

NEWARK, N. J., Oct. 16—The Splitdorf Electrical Co., this city, has received contracts for equipment for its Dixie magneto for the English Daimler, the Italian Fiat and Isotta, and the Renault.

E. V. A. A. Holds Successful Convention

Many Subjects Discussed—Get-Together Between Electric Vehicle Makers and Central Station Interests Advocated—Over 200 Present

CLEVELAND, OHIO, Oct. 18—Two hundred electric vehicle manufacturers, central station men and others representing allied branches of the Electric Vehicle Industry, are here to-day at the opening of the sixth annual convention of the Electric Vehicle Association of America, at which the keynote was the marked improvement in the co-operation between the vehicle makers and the central station people, with a view to a more general use of electrics in all kinds of service. The electric interests have all come to realize that they are not obtaining the recognition which the performance, economy and general utility of electric cars deserves, and the convention evidently intends to get at the root of the trouble and to rectify it at once.

Co-operation Wanted

Nearly every speaker of the day mentioned this co-operation in one way or another, and they were practically unanimous in their belief that this is the salvation of the business. Station men and makers must get together for their mutual benefit: It is still largely a question as to how far one faction must go in its assistance of the other.

Undoubtedly the most interest to-day centered around the talk by George H. Kelly, (Baker, R. and L. Co.) on the problems the electric vehicle industry is facing and how they may be met, and also the report by Chairman Walter H. Johnson of the central station co-operation committee, the remarks of both men being allied in that they struck the same sympathetic note of co-operation. Mr. Johnson's remarks were recommended for circulation throughout the country because they represent so well the views of the gathering.

It was the sentiment that central stations should maintain electric vehicle departments and use electrics wherever possible, although it is inadvisable to try to make them use such cars when other types of vehicles obviously pay better. It was brought out that the only way to make the co-operative idea pay is to reach the central stations which have not already been brought into line.

Progress Made in 1915

Mr. Kelly said that the past year has shown marked development in the co-operation between the different branches of the industry, but the two great problems are the creating of electric car demand, and how to care for the cars after they are sold. He said, that the electric car answers the service demands of 99 per cent of the people in cities, as it has greater speed than any city will permit, and its mileage possibilities are more than any one wants. These are the two big features on which the public must be educated and convinced. The tremendous problem, he said, is how to show the pubilc of what the electric is actually capable. First the electric vehicle people must sell themselves on the merits of the cars, and then the rest will follow.

Electric Taxicabs Coming

The electric taxicab received a great deal of interest, Mr. Kelly predicting, that in five years it will have completely displaced the gasoline type. I. S. Scrimger, Detroit Taxicab & Transfer Co., which is the pioneer in this field, gave some information regarding the successful operation of such vehicles, and the interest shown may be taken as most significant of the development that is to come.

Two cars are here after long cross-country runs, demonstrating that electrics can be run long distances. The Ward electric successfully made the 740-mile run from New York without mishap, and one of the Detroit taxicabs was driven from Detroit.

1916 Officers Appointed

CLEVELAND, OHIO, Oct. 19—Business sessions of the Convention were closed following the election of officers for the ensuing year. These will be as follows:

President, W. H. Johnson, Philadelphia Electric Co., Philadelphia; vice-president, E. S. Mansfield, Edison Electric Illuminating Co., Boston; treasurer, H. M. Edwards, New York Edison Co. Directors, W. H. Blood, Jr., Stone & Webster, Boston; P. D. Wagoner, General Vehicle Co., Long Island City; G. H. Kelly, Baker R. & L. Co.; J. F. Gilchrist, Commonwealth Edison Co., Chicago.

The incoming administration is therefore represented by four central-station men and two vehicle manufacturers. The attendance was over one-fourth central-station representatives and one-seventh car manufacturers. The keynote of to-day's business was the favorable reception of an invitation given by E. A. Lloyd, president of the National Electric Lamp Association, for co-operation with that body with possible future affiliation as the result. The discussion Tuesday emphasized the fallacy of trying to sell electric trucks for service better adapted to other types of vehicles, and the central station was designated as the most valuable influence in persuading municipalities to adopt electric vehicles. There was considerable interest in the new battery rental schemes that are coming into vogue, many seeing in this movement a helpful factor in relegating the most annoying battery worries to the discard.

Of the papers presented to the meeting all had special interest for different classes of membership, and two which bear particularly on the manufacturing end of the automobile industry are reprinted in but slightly abridged form below.

Why Electric Taxicabs Should Succeed

By I. S. Scrimger

Electric taxicabs were first considered by the Detroit Taxicab & Transfer company about two years ago, although personally, I had considered the matter two years prior to the time my company took the proposition up.

I think everyone in the taxicab business will bear me out when I say that the life of a well made gasoline car in a hard service, such as the taxicab business is, could not be much over five years at the outside. My judgment is that a gasoline car to perform satisfactorily will cost $2,000 to $2,500. Using the five-year period as the maximum as the life of the gas car, it means that a taxicab company is replacing their equipment every five years.

In Detroit, we get 70 cents for our first mile and 40 cents for each additional mile; single tariff meters being used. In other words, it doesn't make any difference as to the number of passengers carried, whether one or four—the capacity of the cab—the rate is the same. Comparative figures between the Detroit Taxicab & Transfer Company and other companies in the United States show that the cost of operation per mile is between 30 and 35 cents. Taking the 30 cents per mile cost as the basis for figuring, if a cab covers 2 miles we receive $1.10. If the cab returns empty, we have covered a distance of 4 miles for

which we have received $1.10. The cost per mile being 30 cents shows that we have lost on this run, and the history of the taxicab business throughout the United States is that from 40 to 50 per cent of our distances covered are empty mileage. The revenue obtained from service rendered in Detroit is about 33 cents a mile. You will, therefore, see that very little profit is to be made with an expense of between 30 and 35 cents a mile and an income of 33 cents a mile. It, therefore, became necessary that we obtain equipment that could be operated more cheaply than gasoline cabs.

First Cab Successful

About two years ago, we decided to build one electric cab as an experiment, and the president of this company and myself consulted with the manufacturers of electric vehicles in Detroit, but they were all too busy to give us much thought, and claimed they could do nothing for us unless we were willing to accept the chassis for the pleasure car they were building. The taxicab business being a commercial business, we could see how a pleasure electric car could be made to serve our purpose. We, therefore, were compelled to build our first car. This we did under the supervision of our engineer, Mr. W. J. Behn. Our first car was placed in service at the Hotel Ponchartrain at 2 o'clcock in the afternoon, June 25, 1914, and up to the present time has been in continuous service about a year and three months. No advertising was done, nor an announcement of any kind made when this cab went into service. We thought it best to start the electric service, and allow the public to judge whether or not the electric cab would meet all requirements. It was only a short time when we commenced to receive letters of approval, and the cab met with such a signal success that we decided to build eleven more. These additional eleven electric cabs went into service last December and January, and have, therefore, been in service about eight months. We are just completing fifteen additional electric cabs, which will be completed between now and the 15th of October, and we have twenty more under way, which will be in service about the 1st of January. This will give us an equipment of forty-seven electric cabs.

Cab Field Neglected

It seems to me that the manufacturers of electric vehicles have not kept pace with the manufacturers of gasoline vehicles. I mean by this that the public demand better mileage and better looking cars than those that are now in service throughout the country. One of the first questions we are asked is—how many miles can you get on ane charge, and then—how fast will they go?

All of our twelve cabs now in service are being operated 24 hr. a day with two drivers; each man working 12 hr. To enable us to operate our electric cabs 24 hr. a day, we have had installed at the edge of the sidewalk at the Hotels Statler, Tuller, Griswold House, and Ponchartrain charging boxes, and our cabs, while standing idle, are on charge. The Edison Illuminating Company of Detroit have co-operated with us in every way possible, and has given us power wherever it was possible to do so.

We feel that we have constructed for our service a thoroughly up-to-date, practical electric taxicab. Some eight years' experience with the gasoline car taught us the weak points of the gas car, and we have tried to overcome them with our new construction.

Our cab has a 121-in. wheelbase, and the interior of the cab body proper has a space about 68 in. long and about 50 in. wide, which you will see enables us to carry from four to five passengers very comfortably. Our experience taught us that the limousine type of body was preferable to the landaulet type, and could be operated with less expense. We are using Silvertown Goodrich pneumatic tires, and have already made a wonderful mileage showing with these tires.

In conclusion, our operating cost per mile up to the present time has not exceeded 20 cents a mile. This cost includes drivers' wages, overhead, tire expense, garage expense, depreciation and every expense in fact which is incidental to the operation of the taxicab business. The only point on which we are uncertain is the life of the car. We feel that the car has been so well made that we may be able to depreciate this car over a period of ten years. This, of course, is a problem which time alone will tell whether or not we are correct.

Performance of Gas and Electric Trucks

By William J. Miller and Stephen G. Thompson

One of the many favorable arguments advanced by the electric vehicle salesman in his efforts to combat the more popular gasoline machine has been that in its field of application this type of vehicle can accomplish practically as much in a day as can the higher speed gasoline machine, and do so at a less cost.

This paper is compiled with the purpose of developing the statement from one of theoretical assumption to one of scientific fact substantiated by practical demonstration; and to do this clearly, recourse to several charts has been made, which not only makes for brevity in the paper itself but has the advantage of concise presentation.

In pursuing this argument several factors must first be ascertained, and their relation to the subject as a whole weighed to determine all the contributory causes for the existence of the belief at all. Of these factors the important ones are:

1. The speed of acceleration and of deceleration of the gasoline machine;
2. The speed of acceleration and of deceleration of the electric machine;
3. The probable frequency of stops expressed in stops per mile;
4. The effect of other traffic on the highway as it relates to stops and speeds;
5. The total time available for running the vehicle.

This last is so important that it might be the determining factor in deciding whether to use power wagons at all, because with a relatively high standing time the advantages of power wagon operation over those of horse-drawn vehicles entirely disappear, as the proportion of the day when the machine is running is insufficient to make an appreciable reduction in the total running time; hence the machine can do no more work.

Now, returning to the several factors bearing upon the subject in hand, the first two, relative to the speed of acceleration and deceleration of the gasoline and electric machines, are shown in the following:

TABLE I

Elapsed Time in Seconds	Speed M.P.H.		Total Distance Traveled (ft.)	
	Gas	Elec.	Gas	Elec.
1.....	1.5	2.5	1.10	1.84
2.....	2.0	4.2	4.40	6.98
3.....	4.4	5.4	10.03	14.33
4.....	4.4	6.0	16.79	22.78
5.....	5.0	6.6	23.84	32.04
6.....	5.6	7.2	31.63	42.33
7.....	6.8	7.6	40.59	53.35
8.....	8.4	8.0	51.61	64.81
9.....	9.0	—	64.39	——
10.....	8.8	—	77.43	——
11.....	8.5	—	90.10	——
12.....	9.6	—	103.51	——
13.....	10.6	—	118.79	——
14.....	11.2	—	134.96	——
15.....	11.5	—	151.79	——
16.....	11.8	—	168.91	——
16 2-5...	12.0	—	186.50	——

This shows a series of observations on the acceleration and deceleration of gasoline and electric trucks of equal load capacity and quality made under identical operating conditions, the gasoline vehicle, however, having a speed capacity of 50 per cent in excess of that of the electric.

It will be observed that for the first eight seconds of acceleration the speed of the electric machine exceeds that of the gasoline, at which time it has reached its maximum, and that the acceleration of the gasoline machine to a speed 50 per cent higher than that attained at this point requires practically the same time in seconds, the elapsed time, speeds in miles per hour and distance traveled for each type of machine being as follows:

Table II. is a record of a series of observations on a delivery service in a city

of 750,000 inhabitants and the surrounding towns, operating within a radius of 15 miles of the business center.

For purposes of segregation the statistics are charted in zones according to the mean distance from the delivery route to the store. The mean distance is one-half the sum of the distance from the store to the first delivery stop and from the last delivery stop returning to the store. The characteristics of the zones may be given as follows:

Zone 1—Business and city residential apartment house sections;

Zone 2—Residential apartment houses and flat sections;

Zone 3—3-apartment flat sections and private houses;

Zone 4—Private houses in suburban towns.

This Table II. requires close analysis, as in it is contained the factors controlling the operation of a delivery system and limiting the movement of the vehicles employed. These factors are here emphasized, as they are those usually overlooked in the ordinary course of power wagon application; and because they are overlooked the popularity of the gasoline machine sways the buyer toward it regardless of the practicability of its application.

These important contributory factors are enumerated in the title heads of the table, and establish the following:

1. Probable average stops per mile:
   Zone 1.....6 Zone 3.....5
   Zone 2.....7 Zone 4.....4

2. Time elements in proportion to the total consumed, as follows:

Time running on route..... 29.86 per cent
Time running off route..... 17.76 per cent
Time delivering..... 28.18 per cent
Time loading ..... 24.20 per cent

3. Relative values of the "miles off route" and the "miles on route" 36 per cent and 64 per cent respectively.

With all of this accumulated data, we have established the factors affecting the speed of movement as it relates to the total day's work performance of gasoline or electric machine, and by applying these to the different zones the efficiency of the two types of vehicles may be determined. Therefore, if we resolve all these factors to a comparative basis we will find that for equal work performance the gasoline machine will but slightly excel the electric, which difference is of little consequence when the time-saving effected is properly segregated into the different time elements of a 9-hr. day. For example, on the basis of the calculations in Table II, the time elements in a 9-hr. day would be as follows:

Time running on route... 2 hours 41 minutes
Time running off route... 1 hour 36 minutes
Time delivering..... 2 hours 32 minutes
Time loading ..... 2 hours 11 minutes

Of these only the first two are affected by the relative speeds of the machines, the first being partially governed by the frequency of stops and the second by the speed capacity of the machine.

On an average basis of six stops per mile and a daily work performance equal to that possible with the electric vehicle, deductions based upon the facts as presented in Tables I. and II. would determine the daily saving of gasoline machine over electric to be 73 min., which for increased performance must be segregated into the time elements as follows:

Time running on route..... 21.80 minutes
Time running off route..... 12.96 minutes
Time delivering..... 20.57 minutes
Time loading..... 17.67 minutes

It will be seen that all of the foregoing is based upon unimpeded traffic when the machines are able to reach their maximum speed between stops and when running off route. Now if we qualify these figures with a consideration of the effect of traffic stops and slow-moving traffic, we then find that this apparently increased efficiency of the gasoline machine will almost entirely disappear. For proof of this we have the record of 100 days' observation of two gasoline and two electric trucks of equal capacity operating in the service of the Central Stamping Company between Newark, N. J., and New York City. Here it was found that the gasoline machines could attain an average of only 58 per cent of its maximum speed, while the electric maintained 72 per cent of its maximum possible speed. Expressed in miles per hour, this amounted to 6.1 miles for the gasoline machine and 5.8 miles for the electric.

The value of this increased speed, or, for that matter, the increased efficiency as deducted in our calculations, is rather questionable when the cost of obtaining it is considered.

Table II

	Mean distance to route	No. of stops	Miles on route	Miles off route		Approx. stops per mile on route	Time factors					
							Running		Del'y min.	Load min.	Total	
				Out	In		On route min.	Off route min.			Hr.	min.
Zone 1	0.4	9	1.0	0.5	0.3	9.0	9.5	6.5	19.0	35	1	10
	0.45	20	4.3	0.6	0.3	5.0	42.0	14.0	39.0	34	2	9
	0.45	29	6.1	0.7	0.2	4.9	42.0	15.0	32.0	43	2	12
	0.5	23	4.3	0.7	0.4	5.0	35.0	15.0	46.0	53	2	29
	0.6	25	3.3	0.7	0.6	8.0	41.5	10.0	26.5	31	1	49
	0.6	21	3.75	0.6	0.6	6.0	27.0	9.0	34.0	69	2	19
	0.6	7	2.1	0.8	0.4	3.0	11.0	6.0	7.0	6		30
	0.7	11	2.5	1.1	0.4	4.4	18.0	18.0	18.0	50	1	44
	0.8	17	3.4	1.1	0.5	5.0	23.0	17.0	31.0	43	1	54
	0.85	24	3.1	1.1	0.6	8.0	38.0	23.0	48.0	38	2	27
	0.9	36	3.9	0.4	1.4	9.0	34.0	13.0	57.0	47	2	31
Zone 2	1.0	16	3.5	1.8	0.2	4.5	32.0	13.0	13.0	46	1	44
	1.0	50	8.0	1.0	1.0	6.0	93.0	35.0	111.0	30	4	29
	1.0	23	3.5	1.5	0.6	7.0	27.0	23.0	77.0	29	2	36
	1.1	40	9.0	1.0	1.3	4.5	76.0	34.0	46.0	64	3	40
	1.1	45	7.3	1.1	1.2	6.0	68.0	24.0	48.0	65	3	25
	1.1	22	3.3	1.5	0.8	6.6	25.0	18.0	33.0	44	2	
	1.1	25	2.2	1.1	1.2	11.0	27.0	24.0	48.0	44	2	23
	1.1	21	3.8	0.9	1.4	5.5	34.0	15.0	39.0	34	2	02
	1.1	20	4.0	1.7	0.6	5.0	38.0	21.0	57.0	58	2	54
	1.4	37	5.9	1.1	1.7	6.0	55.0	31.0	55.0	49	3	10
	1.6	26	5.1	0.7	2.5	5.0	28.0	31.0	41.0	46	2	26
	1.7	46	7.7	1.9	1.6	6.0	72.0	33.0	56.0	34	3	15
	1.7	30	2.4	1.6	1.8	12.5	25.0	26.0	39.0	44	2	14
	1.8	71	20.6	1.9	1.8	3.5	181.0	98.0	142.0	22	7	23
	1.9	35	3.7	3.2	0.7	9.3	30.0	27.0	43.0	52	2	32
	1.9	43	7.4	2.2	1.7	6.0	62.0	36.0	64.0	83	4	05
	1.9	42	7.0	2.2	1.7	6.0	59.0	34.0	85.0	77	4	15
Zone 3	2.0	31	8.0	1.9	2.1	4.0	64.0	38.0	34.0	25	2	41
	2.0	24	8.5	3.1	1.0	3.0	86.0	39.0	79.0	42	4	06
	2.1	51	12.2	1.7	2.5	4.0	117.0	50.0	142.0	125	7	14
	2.1	32	4.9	2.2	2.0	7.0	39.0	43.0	55.0	40	2	57
	2.1	51	11.3	2.0	2.2	4.4	97.0	30.0	87.0	48	4	22
	2.2	40	5.6	2.0	2.5	8.0	53.0	46.0	52.0	59	3	30
	2.6	27	4.2	2.3	2.8	6.5	40.0	45.0	34.0	19	2	18
Zone 4	2.9	59	10.8	2.6	3.3	5.0	92.0	50.0	81.0	34	4	17
	3.0	29	4.5	2.1	3.9	7.0	55.0	47.0	34.0	51	3	07
	3.25	27	7.7	3.3	3.2	3.5	68.0	53.0	45.0	30	3	16
	3.3	43	8.2	3.3	3.3	5.2	80.0	59.0	51.0	60	4	10
	3.4	44	9.1	3.3	3.4	4.8	80.0	54.0	58.0	58	4	10
	3.7	26	5.3	3.6	3.8	5.0	50.0	58.0	36.0	77	3	41
	6.8	67	25.1	6.8	6.9	2.6	183.0	91.6	136.0	35	7	25
	8.5	53	19.6	7.2	9.9	2.7	131.0	108.0	69.0	43	5	51
		1418	287.15	82.1	80.3		2488.0	1480.5	2347.5	2016	138	52

Continental 100% Stock Dividend

Motor Co. Increases Capital —$500,000—Surplus $500,000 Over 1914

DETROIT, MICH., Oct. 20—*Special Telegram*—At a stockholders' meeting held yesterday it was decided that the capital stock of the Continental Motor Manufacturing Co. be increased $500,000 or to $2,900,000. A stock dividend of 100 per cent was declared. The surplus for the fiscal year ending June 30, was over $1,200,000 or $500,000 more than in 1914.

10,548 Cars in Spain

MADRID, SPAIN, Oct. 16—The total number of private automobiles registered in Spain on Jan. 1, 1915, was 10,548. The Province of Madrid led with 2405 registrations. The population of Spain is about 20,000,000, giving a car-to-population ratio of one in every 1896 people. These statistics serve to indicate a large field apparently practically untouched. This is brought out by comparison with the United States, where there are over 2,000,000 cars to 100,000,000 population.

No Gasoline on Sunday in Elizabeth City

ELIZABETH CITY, N. C., Oct. 15—Automobilists who travel to or through this city on Sundays will do well to investigate their supply of gasoline and lubricants; they will not be able to get these needed supplies on a Sunday. This has been decided by the Board of Aldermen which has passed an ordinance to that effect. The ordinance also applies to cigars, cigarettes and tobacco, and the only commodities which can now be purchased on the seventh day of the week, are, drugs, milk and ice cream.

Change in D. C. License Board

WASHINGTON, D. C., Oct. 16—The District of Columbia automobile board has ceased to be a separate branch of the local government and has been amalgamated with the license branch of the assessor's office. W. H. Coombs, license clerk, is designated as its secretary.

Wisconsin Cars Average $480 Value

MILWAUKEE, WIS., Oct. 16—The average value of automobiles in Wisconsin, according to the computation of the Wisconsin tax commission, is $480, compared with a valuation of $635.52 used in 1914. The greater number of cars now owned in the State is responsible for the decrease in average valuation. At the same time the average valution of a horse has decreased from $104.32 to $101.93; a cow, from $37.22 to $36.94; a hog from $12.69 to $10.58. At the decreased average valuation, the total valuation of motor vehicles, exclusive of motorcycles, has increased $4,887,152, and the grand total valuation of motor vehicles for the 1915 tax roll is $29,792,879. Only 66,847 motor vehicles of the 79,000 registered are actually assessed.

Bad Pavements Make Dimmers Hardship in Akron

AKRON, OHIO, Oct. 16—Following the police crusade against motorists who drive with undimmed or without lights, which resulted in the arrest of twenty-eight automobilists, directors of the Akron Automobile Club called a meeting to extend the co-operation of the club to the police in enforcing the ordinance.

In enforcing the dimmer ordinance, however, the club urged upon police the use of discretion in making arrests for, it was held, the streets of Akron are in such bad condition in many sections that lights stronger than 12-candlepower are needed in avoid accidents in passing over them.

Depreciation Table for Assessors

OLYMPIA, WASH., Oct. 12—To assist county assessors in valuing automobiles, the commission is suggesting the adoption of a uniform depreciation table. According to the table an automobile originally costing $500 has depreciated in value 10 per cent when first put in service, and is worth only $370 at the end of six months. For the second year its value is $320, for the third year $270, fourth year, $220 and fifth year, $170 and after five years $140. Similar rates of depreciation are adopted for cars of higher values.

Seventeen Cars Deliver Cleveland Mail

COLUMBUS, OHIO, Oct. 16—Seven automobiles replaced horse-drawn wagons in the transfer of mail to and from local railroad depots recently, when the new contract for this work went into affect. There are now seventeen automobiles engaged in carrying mails for the Columbus postoffice. But two single-horse wagons, delivering parcel post matter in the business district, are now used by the local postal department.

Postmaster Kinnear said the mails were out 30 min. earlier in the morning as the result of the difference in speed of the cars over the horses.

Hunt Stromberg Detroit Manager

DETROIT, MICH., Oct. 19—George H. Hunt, formerly connected with the offices of the Stromberg Motor Devices Co., Chicago, has been appointed manager of the Detroit branch.

25,000 in Safety First Federation

N. Y. Accidents Reduced 4790 in Nine Months Due to Society's Work

DETROIT, MICH., Oct. 19—At to-day's first session of the first annual convention of the Safety First Federation of America, after the introductory address by President Darwin P. Kingsley, who dwelt upon the subject of permanent world peace, the first annual report was read by Executive Secretary Frederick H. Elliott. It showed that the combined membership of the federation is now about 25,000. Statistics were read showing what the Safety First Society of New York had accomplished within the rather short period it has been in existence, one striking example given being that of the reduction in the non-fatal accidents in the streets of New York between Sept. 1, 1914, to May 31, 1915, during which period the new ordinance suggested by the society and which provides for near side stop for surface cars, has been in effect. During that time there were 4790 less non-fatal accidents than in a corresponding period before the ordinance went into effect.

Urges Examination of All Drivers

Harold W. Newman, commissioner of public safety of New Orleans, La., spoke on the subject, Necessity of Examining All Motor Vehicle Operators. He urged that not only be it compulsory for chauffeurs to be examined as to their fitness to operate an automobile, but said that it is just as important that every car owner and car purchaser should be compelled to undergo a thorough examination.

Furthermore, it is suggested by the speaker that only those who pass the examination successfully be permitted to drive a car. Such action should be country-wide.

Co-operation on Behalf of the Automobile Manufacturers was the subject of J. Walter Drake, president of the Hupp Motor Car Co., who spoke as the representative of the National Automobile Chamber of Commerce, Inc. The keynote of his talk was that what is and will always be most needed in the safety first movement as well as other campaigns for betterment, is education of the people rather than legislation.

Zimmerschied to Speak

To-morrow Karl W. Zimmerschied, chairman of the standards committee of the Society of Automobile Engineers, is scheduled to address the convention, his subject being: The Contribution of Automobile Engineers to the Movement for Public Safety.

Ford Surplus Gains $10,308,738.59 in 10 Months—$43,788,151.23 Cash on Hand

Fiscal Year Changed—Cash on Hand Increased $16,346,682.44 Over 1914—Total Assets Are $88,535,840.41, an Increase of $26,903,583.25 for Year

DETROIT, MICH., Oct. 14—The Ford Motor Co. during its 1915 fiscal year, which ended July 31, and extended over a period of only ten months, instead of twelve, as in 1914 and former business years, was able to set aside the extraordinarily large surplus of $59,135,770.66. This is an increase of $10,308,738.59 over the surplus at the end of 1914, $31,011,507.66 more than the surplus was in 1913 and an increase of $44,390,675.09 over the 1912 surplus.

Even more astonishing is the cash on hand or in banks, which totaled $43,788,151.23 at the end of last July, or ten months, while at the end of September, 1914, or for twelve months, the total was only $27,441,468.79 which means that in the ten months of the 1915 business year the cash increased by $16,346,682.44. In 1913 the cash balance was $13,225,710.82 and in 1912 it totaled $6,400,100.66.

The total assets for the past year amount to $88,535,840.41 or an increase of $26,903,583.25 over 1914. On the assumption that the fiscal year had been of twelve months instead of ten, the total assets might have reached the enormous sum of $103,291,814.41 and the surplus might have totaled $73,891,744.66.

$14,335,767.87 in Merchandise

Among the different items mentioned among the assets the biggest is that of merchandise, which means raw and finished materials or products, inventoried at cost. This account figures for $14,335,767.87 on the balance sheet, which is an increase of $5,051,318.61 over the total of 1914.

Buildings and building fixtures are next on the assets list with a total of $12,931,884.45 or an increase of $2,216,856 over the 1914 total. The factory equipment account shows an increase of nearly $950,000 for the past year while for machinery and power plant there is shown an increase of more than $1,800,000. Another big item is that of real estate, which now has passed the $3,100,000 mark, an increase of nearly one million over the total shown in 1914.

The biggest item listed under the liabilities is $15,000,000 being the buyers' profit-sharing reserve. This is in reality a part of the profits of the company, a part of the total surplus, which is being returned to the purchasers of Ford cars during the fiscal year because the Ford company announced at the beginning of the fiscal year 1915 that if 300,000 cars were sold during the year the buyers of these cars would receive a rebate of from $40 to $60 per car.

$15,000,000 in Rebates

Thus it might be said that the 1915 surplus was actually $74,135,770.66, but, after car No. 300,000 of the 1915 production had been sold, $15,000,000 of the year's surplus was no longer to be considered as such, and became a liability.

Other large items among the liabilities are those of accounts payable, which shows an increase of over $1,600,000 over the total of 1914; contract rebates, which more than doubled and contract deposits which show an increase of over $500,000 for the year. The reserve for depreciation of fixed assets also shows an increase of more than half a million.

The capital stock of the Ford company is still listed as $2,000,000 although it had been decided to increase it considerably.

Ford Company's Cash in Bank or at Hand Increase

Year	Total	Increase
1912	$6,400,100.66	.....
1913	13,225,710.82	$6,825,610.16
1914	27,441,468.79	14,215,757.97
1915	43,788,151.23	16,346,682.44

Ford Company's Surplus Increase

1912	$14,745,095.57	.....
1913	28,124,173.68	13,379,078.11
1914	48,827,032.07	20,702,858.39
1915	59,135,770.66	10,308,738.59

Ford Motor Co.'s Balance Sheet for 1912, 1913, 1914 and 1915

ASSETS

	1912	1913	1914	1915
Cash on hand and in banks	$6,400,100.66	$13,225,710.82	$27,441,468.79	$43,788,151.23
Michigan municipal bonds at cost	1,075,051.48	1,283,943.59	1,330,546.84	1,311,924.10
Accounts receivable	230,912.17	448,233.93	3,233,582.73	2,300,456.42
Merchandise inventory at cost	6,629,533.83	9,046,171.68	9,284,449.26	14,335,767.87
Outside investments	7,772.04	7,433.32	9,200.00	9,200.00
Prepaid expenses	44,591.07	215,259.29	437,089.77	385,377.56
Real estate	820,636.97	1,540,483.42	2,227,567.88	3,148,263.01
Buildings and building fixtures	2,596,115.61	4,615,156.82	10,714,928.45	12,931,884.45
Factory equipment	371,110.90	676,589.49	1,661,155.23	2,606,356.06
Furniture and fixtures	58,059.39	77,357.60	105,263.95	328,497.30
Power plant and machinery	1,843,967.02	2,832,907.33	3,821,465.38	5,693,648.50
Tools	566,510.17	824,901.04	1,199,779.11	1,491,824.85
Patterns	66,884.06	92,710.13	105,992.70	142,998.22
Patents	51,793.96	57,224.27	59,767.47	61,472.84
Machinery, tools and equipment at branches	52,746.30	.....	.....	.....
Total	$20,815,785.63	$35,033,919.86	$61,632,257.16	$88,535,840.41

LIABILITIES

Accounts payable, not due	$2,261,026.63	$3,049,586.86	$3,335,139.01	$4,947,805.81
Accrued pay rolls	149,166.45	191,940.70	537,489.70	428,907.14
Accrued salaries	12,327.45	24,169.30	44,229.95	341,814.16
Accrued expenses	178,766.10	266,119.43	218,140.50	463,111.47
Contract rebates	58,350.00	25,960.00	621,381.12	1,281,661.01
Contract deposits	.....	.....	1,452,622.82	1,968,844.89
Reserve for refunds to take care of reduction in price	75,000.00	.....	.....	.....
Reserve for employees' bonus	242,033.80	134,999.96	.....	.....
Reserve for bad debts	3,655.04	3,510.55	.....	.....
Reserve for depreciation of fixed assets	742,626.89	1,061,805.25	1,935,440.07	2,855,188.94
Reserve for depreciation of patents	51,793.96	57,224.27	59,767.47	61,472.84
Fire insurance reserve	11,900.40	34,059.63	43,934.45	51,263.49
Reserve for profit-sharing	.....	.....	2,557,080.00	15,000,000.00
Unearned profits—branches	284,043.34	60,370.23	.....	.....
Capital stock	2,000,000.00	2,000,000.00	2,000,000.00	2,000,000.00
Surplus	14,745,095.57	28,124,173.68	48,827,032.07	59,135,770.66
Total	$20,815,785.63	$35,033,919.86	$61,632,257.16	$88,535,840.41

*The 1915 statement represents the business for only ten months because last year it was decided to change the end of the fiscal year from Sept. 30 to July 31.

Canadian Ford 50% Dividend

FORD, ONT., Oct. 18—For the third time this year a cash dividend has been declared by the Ford Motor Co. of Canada, Ltd. This time it is of 50 per cent, while on the two previous occasions the dividend was 10 per cent cash. As the capital of the company is $1,000,000 it means $500,000 for the shareholders, this time, or $700,000 all told this year. Most of the stock is said to be held by Henry Ford.

Car for Every 25 Persons in New Jersey

TRENTON, N. J., Oct. 15—One person in every twenty-five in New Jersey owns an automobile or is licensed to drive a car, according to the records of the State Department of Motor Vehicles. Approximately 115,000 persons are licensed to operate. On an average 300 persons are examined every week in Newark.

Car Sales in Norway Good

INDIANAPOLIS, IND., Oct. 19—Alf Neilsen of Christiania, Norway, who has arrived in this country and is interested in the sale of automobiles in Norway as the representative of the Cole Motor Car

Co., states that business conditions in Norway are excellent, and have been so since the beginning of the war. Sweden also is prospering. Both countries have been exporting supplies of various kinds, but in the past few weeks the exportation of foodstuffs have been discontinued, as it is necessary for them to conserve their resources.

In the automobile field prospects are very bright. The country is large and the number of cars is extremely small in proportion to the population. In the entire country there are only 1200 cars in use, and 200 of these are trucks. With the increased prosperity of Norway there is no doubt but that the sale of automobiles is going to reach a high water mark this year.

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Bumper Wheat Crops Presage Good Sales in West

PORTLAND, ORE., Oct. 15—Bumper crops are reported in Eastern Washington and Eastern Oregon. The farmers of the great Inland Empire are inclined to hold their wheat for the high prices which were realized last year. Warehouses and granaries are fairly bursting with grain, but as soon as it begins to roll to market it is predicted there will be a stream of new automobiles rolling up the front yards of hundreds of farmers throughout eastern Oregon and eastern Washington, and in consequence the dealers located at Tacoma, Seattle, North Yakima, Spokane, Walla Walla and Pendleton, Idaho, are going to dispose of their entire allotment of cars.

The banks throughout that section are now much more favorable to the automobile industry than ever before for the reason that the automobile has become to be universally recognized as a necessity instead of merely a luxury, a necessity which is really more valuable to the out-of-town owner than to the city dweller.

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Automobile Sales in Oregon Increase

SALEM, ORE., Oct. 12—Some interesting figures have just been compiled by Secretary of State Olcott, relative to the number of motor vehicles, chauffeur and motor vehicle dealer registrations from Jan. 1 to Sept. 30, inclusive. The total number of motor vehicles was 22,998 for the period, indicating that there was heavy automobile buying, and that it was largely increased over the same period in 1914, when 16,121 motor vehicles were registered. Chauffeurs increased from 1719 to 3804 and dealers increased from 109 to 171.

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8600 Cars in Manitoba

WINNIPEG, MAN., Oct. 15—Manitoba is receiving upward of $100,000 this year from the automobile business. Licenses has already been issued for 8600 cars and probably 500 more applications will be filed.

100,000 Cars for Bay State

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Registrations at Rate of 150 a Day — 19,346 Gain Over 1914—2914 More Trucks

BOSTON, MASS., Oct. 15—Before October is ended there will have been registered in the Bay State more than 100,000 motor vehicles. E. J. O'Hara, who has charge of the registration department, stated to-day that with the numbers being issued at the rate of about 150 a day there was no question about the figures quoted being reached.

In the number of vehicles there were 19,346 more registered this year than for all of last year. For the same period the trucks show a gain of 2914, the makers and dealers 193, the licenses 12,216, the renewals 7452 and the examinations 1308.

Naturally the increase in receipts has been correspondingly large, totalling $234,011.55. Before the year ends the State will have added enough more to make the total at least $250,000 more than last year. One of the most significant items is the fact that there were 1308 more examinations to date than throughout all of 1914, for it shows that the Highway Commission is doing its utmost with the force available to see that operators of cars have some knowledge of handling the machines.

The Commission has just finished taking its triennial highway census throughout the State, but the figures will not be available for some time. The census for October began last Sunday and lasted for a full week. There were 209 people keeping tabs on the traffic of all kinds for the entire week.

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Churchward Leaves Gray & Davis

BOSTON, MASS., Oct. 19—Alexander Churchward, chief engineer of Gray & Davis, resigned Oct. 15. He will take a long vacation. It is stated that no change of policy will follow his resignation from the company.

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Shelley of Packard Returns

DETROIT, MICH., Oct. 17—J. G. Shelley, inspector of trucks for the Packard Motor Car Co., has returned to Detroit after a year spent in Petrograd.

"The motor manufacturer of the United States has won world-wide fame for the sheer honest worth of his product and that will have a tremendous effect after the war ends," Mr. Shelley says. "The developments of the past year abroad have demonstrated more forcibly than anything else could, how greatly the world must depend on gasoline these days and the showing of the vehicles from this country has made them the standard of the earth for heavy duty hauling."

Fred Schaefer, another Packard employee who accompanied Mr. Shelley, will return from Petrograd within two months.

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3139 Overlands Registered in Iowa from April Until August

DES MOINES, IOWA, Oct. 15—From April to August, inclusive, of the current year, 3139 Overland cars were registered in Iowa. In the month of July, 1140 Overlands were registered in the State. From Jan. 1 to September, 1914, the total number of cars registered in Lucas County, Ohio, amounted to 5264. Of this number 786 were Overlands. During the same period this year, 6830 cars have been registered, 1235 of which were Overlands. These figures show that 30 per cent of the total increase in cars registered in the county since Jan. 1, have been Overlands.

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Patagonia Orders Detroiters

DETROIT, MICH., Oct. 16—R. T. Yeats, director of exports of the Detroiter Motor Car Co., Detroit, recently received an order for new Detroiter cars for shipment to Patagonia. This order will be routed via Buenos Aires and is finally destined for Trelew, Patagonia. The new Detroiter is now being represented in forty foreign countries and the sales effected have been remarkable since the re-organization of the company three months ago.

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Overland May Change Fiscal Year

TOLEDO, OHIO, Oct. 14—At the annual meeting of the stockholders of the Willys-Overland Co. which will be held here Oct. 26, it will be proposed to change the end of the company's fiscal year from June 30 to Dec. 31. Other changes to be submitted for approval are that the annual meeting be held on the second Tuesday in May of each year, instead of

Bay State Registration Figures

	Jan. 1 to Oct. 1, 1914	Total, 1914	Jan. 1 to Oct. 1, 1915	Increase Over 1914
Motor vehicles	*73,765	*77,246	*96,592	19,346
Trucks	7,813	8,236	11,150	2,914
Manufacturers and dealers	1,501	1,518	1,711	193
Licenses, operators and chauffeurs	23,492	26,858	39,074	12,216
Renewals, operators and chauffeurs	65,643	72,674	80,126	7,452
Examinations	6,344	7,497	8,805	1,308
Total receipts	$897,994.37	$925,964.75	$1,159,976.30	$234,011.55

*Includes trucks.

the fourth Tuesday in October, as now; that the number of directors be increased from seven to nine; that the officers elected by the directors annually shall hold office during the pleasure of the board of directors instead of for the term of one year; that there be a monthly meeting of the board of directors on the first Tuesday of each month without notice, in addition to the meetings now provided.

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Cars Worth $181,576 Shipped from New York in September

NEW YORK CITY, Oct. 14—South America received from this port during the month of September, 1915, automobiles valued at $181,576. Of this amount $106,295 was for Argentina, with $33,739 for Venezuela and $16,248 for Chile. The rest of the countries ranged from $3,370 to $8,300.

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Chevrolet to Build New Plant in New York

NEW YORK CITY, Oct. 15—The Chevrolet Motor Co. of New York has leased the entire block front on the east side of Eleventh Avenue between Fifty-fifth and Fifty-sixth Streets, fronting 200 ft. on each thoroughfare. The Chevrolet Motor plant now covers the block front directly to the north, between Fifty-sixth and Fifty-seventh Streets. The site will be improved with a modern factory and service building similar to the one it now occupies in this city. With the completion of the new building the facilities of the company will be more than doubled. The concern is also making large additions to its plants at Tarrytown and at Flint, Mich. Within a short time the company expects to be turning out 800 cars a day.

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Goodrich to Insure and Pension

AKRON, OHIO, Oct. 16—Free life and accident insurance and a retirement pension will be given the 15,000 employees of the B. F. Goodrich Co., beginning Nov. 1. The free insurance and pension will be thorough, and applicable to every employee with no cost to him.

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Van Sicklen Opens Detroit Office

DETROIT, MICH., Oct. 14—The Van Sicklen Co. speedometer makers, has opened a branch office and service station at 1255 Woodward Avenue, and C. P. Van Sicklen, son of N. H. Van Sicklen, president, has been placed in charge. The Van Sicklen Co. has also engaged Otto Von Bachelle, consulting engineer, who will be located in the Detroit territory. By opening its branch office here, the company has severed connection with the Cutting, Armstrong and Smith Sales Co.

Stewart-Warner to Add 275,000 Ft.

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New Plant 7 Stories—Will Make Total Floor Area 445,000 Sq. Ft.

CHICAGO, ILL., Oct. 18—The Stewart-Warner Speedometer Corp. has started work on a new factory building, which will have a floor area of 275,000 sq. ft. as compared with the present plant, which has an area of 170,000 sq. ft. of floorspace. Instead of being an addition the new factory is much larger than the old, and will be a seven-story brick and concrete structure measuring 191 by 291 ft. and of U-shape. The new building is being erected alongside the old factory, the corporation having purchased property 125 by 286 ft. The work of razing the residences on the property in the purchase has already begun and it is expected that a city street which separates part of the property from the remainder of the corporation's holdings will be condemned and closed. The company at present employs 1200 men in its factory and hopes with the new building materially to extend its manufacturing facilities as well as its service system. When the new building is completed there will be a total floor area of 445,000 sq. ft.

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Cleveland Employees Demand Eight-Hour Day

CLEVELAND, OHIO, Oct. 15—Three hundred employees of the Bardons & Oliver Machine Co. walked out this week. The men struck for shorter hours and more money. Further demonstrations were held at the Winton Motor Car Co. plant. The situation at the Warner & Swasey machine works remained the same—about 100 of 1200 employees working.

The specific demand is for an 8-hr. day at the 9-hr. rate, with time and a half for overtime.

—

Stearns Gives Ten-Hour Pay for Eight-Hour Work

CLEVELAND, OHIO, Oct. 15—Efforts to perfect union organization among 1000 employees of the F. B. Stearns Co.'s plant were stilled last night when it was announced that beginning Oct. 16, they will receive 10 hr. pay for 8 hr. work.

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Chalmers Men Meet in Denver

DENVER, COL., Oct. 10—Twenty-five Chalmers dealers from Colorado and Wyoming towns were given a banquet last night at the Savoy Hotel by E. J. Johnson, Chalmers distributor for this territory. F. B. Willis, the company's sales manager, and J. M. Robbins, factory representative, gave talks on construction features and practical selling points, and several of the dealers reported upon trade conditions in their respective localities. These reports were all favorable for the season's outlook, and the meeting is counted upon to give the business in this district a substantial push forward.

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3000 Detroit Electrics for 1916

DETROIT, MICH., Oct. 18—Between Aug. 1 and Oct. 1, the Anderson Electric Car Co., which makes the Detroit electrics, has sold 92 per cent as many cars as it sold during the entire year 1914. The business is increasing at such a rate that since Thursday, Oct. 14, a large force is working nights. At the present time the company has between 1400 and 1500 men on its payroll, the largest number in its history. The scheduled output for 1916 is 3000 passenger electric vehicles. The daily average production is now ten cars, but this will probably be increased to fifteen or more before long. An addition, 125 by 125 ft., has been made to the body department, and possibly other enlargements will be made necessary.

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Hyatt Roller Bearing to Build

HARRISON, N. J., Oct. 15—The Hyatt Roller Bearing Co. has let contracts for an eight-story building, 75 by 200 ft., at Middlesex and Fifth Streets and Railroad Avenue, Harrison. It will be of the beam and girder concrete type with brick curtain walls and pilasters.

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347 Studebakers a Day

DETROIT, MICH., Oct. 16—At the Studebaker Corp. all former production records were broken to-day when 347 cars were made. How soon this mark will be passed no one at the plant would dare say, but an official said that he hoped that 500 cars a day will be a matter of fact within the next sixty days.

—

$300,000 Tire Co. Formed

MARION, OHIO, Oct. 16—The Marion Tire & Rubber Co. has been incorporated with a capital of $300,000 to manufacture automobile tires. The incorporators are A. J. Barry, W. H. Holverstott, S. B. Lippincott, W. T. Jones, J. Leonard Price, W. F. Moyer and R. T. Lewis.

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New Sanford Jitney Body

SYRACUSE, N. Y., Oct. 15—The Sanford Motor Truck Co., this city, has brought out a new body for use in interurban passenger traffic. This body is completely inclosed and is especially adaptable for jitney service.

Southern Enthusiasm for Dixie Highway Found at Every Turn

Trail Blazing Party Nearing Goal—All Kinds of Roads Encountered and Some Delay Caused By Mud and Mountains—Few Mechanical Troubles

NASHVILLE, TENN., Oct. 13—This was hoodoo day for the Dixie highway tourists, the ominous date bringing rain, mud, rough roads and a difficult 13 hr.'s run of 164 miles from Elizabethtown, Ky., to the capital of Tennessee. For the first time since the cars started on the long trek to Florida from Chicago, there was rain.

In addition to two water-soaked stretches, there was some rough going this morning in the southern part of Kentucky. The pike was hard enough but it had too much contour. The cars bounded over the outcropping stones which were laid almost a century ago as a foundation of one of the finest highways in the early days of the republic but a highway which lost most of its surface when the artillery and the munition wagons of the Union and Confederate armies rumbled over it. It was impossible to travel at a greater speed than 10 m.p.h.

However, money already has been voted for reconstruction and the work of repairing and resurfacing has been started.

Cars Stand Up Well

Because of the wet and rough going, the tourists were on the road for 13 hr., the longest day's run of the trip so far, the last 60 miles of the day's tour being covered in the dark. Nashville was not reached until shortly before 9 o'clock.

In the tour to date, three of the six State through which the Western link of the Dixie highway runs have been crossed and 658 miles of the 1800-mile trip have been covered. All nine cars have come through without any mechanical trouble and with few stops for tires, there being but one broken spring.

CHATTANOOGA, TENN., Oct. 15—Hawkins Cove is not in the geographies but the memory of its grades and terrors is indelibly stamped on the minds of the Dixie highway tourists who arrived here at 3.30 o'clock this morning after a tortuous 20-hr. ride from Nashville.

It was about 6 o'clock last evening that the motorists first were introduced to Hawkins Cove at the entrance of the Cumberland mountains. The road that passes through its dense timber and leads to the summit of the mountain is a spiral climb of 3 miles with an average grade of 35 per cent at least.

Only three cars made the top by means of their own power. Two mules rendered first aid to the other machines and pulled them up the steep slopes.

30 Miles in Dark

After the ridge of the Cumberlands had been reached and Hawkins Cove was behind, there was a 30-mile run in the pitch darkness over soft, narrow mountain trails that wound in and out among the dense pines. To make matters worse, the eight-cylinder Cole, carrying Judge M. M. Allison, president of the Dixie Highway Association, and other officials, broke a steering rod and a halt of more than 2 hr. to make temporary repairs was imperative.

Residents of Chattanooga waited all through the night and early hours of the morning to welcome the tourists to this historic city. The Dixie bound cars were met at Jasper's Ford, where the Tennessee River was crossed by means of a ferry, by a delegation from the local motor club.

At 4 o'clock this morning, a dinner-breakfast was served at the Patten hotel. The food had been on the fire since 6 o'clock the evening before when the motorists were scheduled to arrive.

In order to give the drivers an opportunity to overhaul their cars and permit the tourists to recuperate from their trip through the mountains, the officials have decided to lay over to-day in Chattanooga. We will take to the road again in the morning when the 140-mile run to Atlanta will be made.

Postponed One Day

This change in the schedule will make the tourists a day late at all the stops in Georgia and Florida, and Miami, the terminus of the tour, will be reached next Saturday, instead of Friday.

ATLANTA, GA., Oct. 16—Under the fairest of southern skies and over the convict-built roads of the Piedmont range of the Cumberland mountains, the Dixie highway tourists rolled through Georgia in triumph to-day and were feted all the way from Chattanooga to Atlanta.

At Rome, earlier in the afternoon, the tourists received a tremendous ovation and three miles outside of Rome 100 cars met and escorted them to the Berry School, a philanthropic institution where the sons and daughters of poor farmers are given an education, and the Shorter College, one of the most exclusive schools for young women in the South. At both places, there were showers of flowers, songs and speeches.

The demonstration was not sporadic, it extended all along the line from Chattanooga to Atlanta. La Fayette was en fete. The town looked as if it was circus day.

At Cartersville, on the afternoon trip from Rome, the cars were showered with chrysanthemums and a band blared a welcome. A welcome arch of cotton bales spanned the main street at Kington, a small village of about 500 residents. The motorists were bombarded with apples, flowers, cotton and boxes of candy at Acworth.

The roads through the foothills of the Cumberlands were easy to negotiate for most of them are hard and the grades are not steep. They are being worked by convicts at the present time.

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Form Company to Further Trade Relations with Russia

NEW YORK CITY, Oct. 20—A joint sales company to operate in Russia and to further the trade relations between the United States and that country is the object of the International Manufacturers' Sales Co. of America, recently organized with headquarters in Chicago and branch offices in New York City and Moscow. A. S. Postnikoff, for many years connected with the International Harvester Co., and who has had wide experience in Russia, heads the new company. The capital stock of the company will be issued to the amount of $100,000, to be held in parcels of $2,000 each by fifty manufacturers of this country, engaged in non-competing lines. In return for this subscription the company engages to handle the export business of the manufacturers. Not only will they receive the profits from the sales of their own products but will also share in the joint profits of the selling organization.

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Ultimatum on St. Louis Headlights

ST. LOUIS, MO., Oct. 16—The local police department recently issued an ultimatum to every owner of an automobile or motor truck calling upon him to submit the headlights of his machine to the Municipal Bureau for adjustment before Oct. 20. After that date, the Chief of Police has ordered the arrest of every automobile driver the lights of whose machine do not conform to the letter of the recent ordinance against dazzling headlights. This order results from the fact that only 20 per cent of the automobile owners of St. Louis have brought their machines to the Shadow Box at the City Hall, which has been available to them without charge for more than a month.

The police and street department officials are discouraging the use of dimming devices and point out that the new ordinance limits only the direction of the light's rays, not their intensity.

Texas Gasoline Cos. on Grill

State Attorney Claims Consumers' Prices Not Based on Supply and Demand

AUSTIN, TEX., Oct. 19—The State Attorney General's Department which has been conducting an investigation into the gasoline and crude oil situation, with particular reference to the alleged fixing of prices of these products and controlling the output, in different cities and producing field of Texas, claims to have discovered evidence that shows that the actual available supply and demand has little to do with the prices that are charged the consumer. The fact that gasoline prices in Austin and other cities of the State steadily mounted upward during the last four months from 10 cents to 17 cents per gallon and that each advance was made simultaneously by practically all dealers led to the conclusion that a combination was back of the trade. This belief has been fully substantiated, according to the statements of representatives of the Attorney General's Department who conducted the investigation. Already the price of gasoline has dropped from 1 to 3 cents per gallon in San Antonio, Austin and other towns and cities of Texas. These reductions were due, it is said, to the activities of the Attorney General's Department. It is reported on trustworthy authority that preparations are being made by Attorney General B. F. Looney to file suit against all of the Texas refining companies for heavy penalties and for forfeiture of their respective charters for alleged violations of the anti-trust laws in fixing the price of gasoline.

Boost Crude Prices

The reason which the refiners give for raising the price of gasoline is that production of crude oil has materially decreased. It is alleged by the Attorney General's Department that the refiners own the crude oil supply, including the producing wells and that when they want to boost prices of the crude product and gasoline they cap the wells and thus bring about a decrease in the output.

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Portland Gasoline Up Two Cents

PORTLAND, ORE., Oct. 12—Within the past fortnight the price of gasoline in Portland and Multnomah county has advanced 2 cents and the indications are that the end is not in sight. Some of the wisest heads are now declaring that the price will ascend gradually until a retail figure of 18 to 20 cents is reached.

Until two weeks ago gasoline was wholesaling at 9½ cents in Portland. Several of the cut-rate houses were then retailing at 10 cents a gallon, while the filling stations operated by the wholesale companies were commanding a retail price 2 cents in advance of the wholesale figure. Then the wholesale price was advanced a cent and the retail price experienced a similar advance.

Last week orders came for another penny increase, making the wholesale price 11½ cents. The retail prices now vary all the way from 12 cents to 13½ and 14 cents.

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Few Market Changes

NEW YORK CITY, Oct. 19—Markets this week were dull and very few changes occurred. There were three gains and three losses. The heaviest gain took place in the metal markets. The heavy sale of tin which has been going on during the last few weeks has made tin advance to $33 per 100 lb., making a total gain of 25 cents. Antimony is firmer and slightly higher with a better demand. Holders are asking 28 and 28½ cents for spot duty paid. Aluminum, which had all week been holding at a good advance, yesterday was somewhat easier, there being sales of spot at 50 and 55 cents in ton lots. Copper is firm, the asked price being 18 cents for both electrolytic and lake in ton lots only. The steel markets are dormant, there being very few sales made and no changes in prices.

A somewhat better demand was reported for some grades of crude rubber, though there was no snap to the trading. Despite the activity in the rubber markets, manufacturers seemed to want only small lots. Up-River Para fine quoted at 57 cents. The oil and lubricants markets were not very active last week. No changes took place although the trading conditions were a bit more normal. The demand for naphthas continues active and the market retains a firm tone. No changes were reported in crude oil quotations. In the animal oils market trading was more active, inquiries for moderate quantities being received. Prices continued to rule steady. Mineral lubricants market was also active with many buyers on hand. The prices continued the same. Although gasoline has made no further advance it is expected to rise within a short time, making the price per gallon 25 cents.

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Eight per Cent Dividend for Unsecured Detroit Body Creditors

DETROIT, MICH., Oct. 16—Unsecured creditors of the Detroit Body Co., are now receiving a first dividend of 8 per cent, and it is possible that a further payment will be made later. Thus far the trustee has paid claims amounting to $211,691.18. After the appointment of the Security Trust Co. as trustee, May 8, 1915, the Fisher Body Co. made an offer of $170,000 for the bankrupt concern's plant and materials. This offer was 70 per cent over the appraisal value, and, was accepted after a public auction at which no higher bid was made.

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Chalmers Stock Listed

NEW YORK CITY, Oct. 15—Chalmers Motors stock has been admitted to official trading in the outside securities market in this city. The common stock has paid $10 per share for several years. It is expected that the company will earn at least 30 per cent for the $5,000,000 in common stock this year. This stock heretofore has been traded on the Detroit Exchange, and is now listed also on the Philadelphia Exchange.

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Book on South American Finances

WASHINGTON, D. C., Oct. 15—"Financial Developments in South American Countries," is the title of a new publication just issued by the Bureau of Foreign & Domestic Commerce which should be of great value to all those who are seeking to expand their trade in South America.

The booklet contains forty pages and covers the situation as regards currency; the money market; the principal banks

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.50	.55	.55	.55	.55	.50	.....
Antimony	.27½	.28	.28	.28	.28	.28	+.00½
Beams and Channels, 100 lb.	1.56	1.56	1.56	1.56	1.56	1.56	...
Bessemer Steel, ton	24.50	24.50	24.50	24.50	24.50	24.50	...
Copper, Elec., lb.	.18	.18	.18	.18	.18	.18	...
Copper, Lake, lb.	.18¼	.18	.18	.18	.18	.18	—.00¼
Cottonseed Oil, bbl.	7.86	7.80	8.00	7.60	7.65	7.80	—.06
Cyanide Potash, lb.	.23	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.42	.42	.42	.42	.42	.42	...
Gasoline, Auto, bbl.	.17	.17	.17	.17	.17	.17	...
Lard Oil, prime	.85	.85	.85	.85	.85	.85	...
Lead, 100 lbs.	4.52½	4.52½	4.50	4.50	4.50	4.50	—.02½
Linseed Oil	.60	.60	.60	.60	.60	.60	...
Open-Hearth Steel, ton	25.00	25.00	25.00	25.00	25.00	25.00	...
Petroleum, bbl., Kans., crude	.80	.80	.80	.80	.80	.80	...
Petroleum, bbl., Pa., crude	1.75	1.75	1.75	1.75	1.75	1.75	...
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	...
Rubber, Fine Up-River, Para	.57	.58	.57½	.57½	.57	.57	...
Silk, raw, Ital.	4.05	...	4.05	...	4.05	4.10	+.05
Silk, raw, Japan	3.90	...	3.90	...	3.90	3.87½	—.02½
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	32.75	32.62½	32.87½	32.75	32.75	33.00	+.25
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	...

and the general condition of business in Argentina; Bolivia; Brazil; Chile; Peru and Uraguay during the last two or three years.

William H. Lough, vice-president of the Alexander Hamilton Institute, who has only recently returned from a trip through the countries treated, is the author of the book. It may be obtained from the superintendent of documents, government printing office, Washington, D. C., for 5 cents per copy.

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Studebaker War Order Profits $20 a Share, Common

DETROIT, MICH., Oct. 16—The Studebaker Corp., by the end of the current fiscal year, Dec. 31 next, will have completed well over $20,000,000 of war orders, on which profits are expected to amount to over $20 per share of common stock outstanding.

Domestic business is running more than double that of a year ago. The 1916 schedule calls for 70,000 cars for domestic use and 6,000 for export. This compares with an output in the past year of about 40,000 cars. Production in 1914 by Studebaker was 36,430 cars, and in 1913, 32,504 cars.

For the calendar year 1915, it is expected that common share earnings will be over $35. The stock is now on a 5 per cent dividend basis. The directors meet next month on the next declaration.

The cash balance of the company is nearly $7,000,000. It is expected that by the end of the year the company will have practically wiped out its note issue amounting to $12,000,000.

Security Prices Higher

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Sturdy Demand in All Stocks —Miller Rubber Makes High Mark

NEW YORK CITY, Oct. 18—A few substantial gains occurred last week in the securities markets, ranging from ½ to 30 points while the losses recorded ranged from 1½ to 15 points. There were many issues which recorded no change at all and these remained firm throughout the week. The trading conditions were somewhat brisker, although the buying was normal. A number of gains took place in the specialties. Chevrolet, which was first rated last week, made a gain of 26 points, the highest to take place in the specialties. Then following closely were Chalmers and Studebaker, both making their total gain 19 points. White made a gain of 16 points while the rest of the issues made either small or no gains at all.

Tire Prices Normal

Tire prices were normal last week, although many issues made but small gains. Miller Rubber made a gain of 30 points, the highest that has been recorded in the rubber markets for several months. Kelly-Springfield common and Firestone were weak in the early dealings and sold down sharply from the recent high level both had made. Swinehart and U. S. Rubber rose 2 points. Sales of stocks were small, as the buyers preferred holding back for further gains.

Detroit Stocks Active

Although the gains that took place in the Detroit market were not heavy the trading conditions were on a somewhat brisker scale. Here many stocks changed hands. Studebaker featured the market with a 16-point rise. Packard rose 5 points and Maxwell 3¼ points. The rest of the gains were small, ranging from ½ to 2¾ points. General Motors declined 25 points, being the only issue in Detroit to make a decline. The inactive stocks were weak, Canadian Ford declining 50 points.

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U-S-L Convention Closes

NIAGARA FALLS, N. Y., Oct. 16—The annual sales convention of the U. S. Light and Heat Corp. was brought to a close to-night, more than 50 branch managers and salesmen from all over the country having been guests of the company for the past three days.

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Form $100,000 Armored Car Co.

PHILADELPHIA, PA., Oct. 16—Joseph F. Curtain, Samuel B. Howard and H. O. Coughlan of New York, are the incorporators of the Armored Motorcar Co., capitalized at Dover at $100,000. The company will manufacture motorcars and aeroplanes.

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Dividend Declared

Willys-Overland Co., quarterly of 1 1-2 per cent common; payable Nov. 1 to stockholders of record Oct. 21.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	..	..
Aluminum Castings pfd			102	..	..
J. I. Case pfd			79	81	+1
Chalmers Motor Co. com			170	175	+19
Chalmers Motor Co. pfd			98½	102	..
Chevrolet Motor Co.			130	135	+26
Electric Storage Battery Co.			71	71½	+1
Firestone Tire & Rubber Co. com			575	..	..
Firestone Tire & Rubber Co. pfd			112	..	..
General Motors Co. com			326	328	—15
General Motors Co. pfd			112	113	+1
B. F. Goodrich Co. com			76	77¼	+2½
B. F. Goodrich Co. pfd			109	111	+ ½
Goodyear Tire & Rubber Co. com			330	337	—8
Goodyear Tire & Rubber Co. pfd			108½	110	..
Gray & Davis, Inc., pfd			..	..	..
International Motor Co. com			32½	33½	+5
International Motor Co. pfd			60	65	+5
Kelly-Springfield Tire Co. com			215	220	..
Kelly-Springfield Tire Co. 1st pfd			90	92	..
Kelly-Springfield Tire Co. 2d pfd			225	235	..
Maxwell Motor Co. com			61	61½	+4½
Maxwell Motor Co. 1st pfd			96	97½	+3
Maxwell Motor Co. 2d pfd			50	51	+4
Miller Rubber Co. com			228	..	+30
Miller Rubber Co. pfd			109	110	..
New Departure Mfg. Co. com			..	..	..
New Departure Mfg. Co. pfd			..	..	..
Packard Motor Car Co. com			140	147	+1
Packard Motor Car Co. pfd			101	105	..
Paige-Detroit Motor Car			435	450	..
Peerless Motor Car Co. com			122	..	..
Peerless Motor Car Co. pfd			92	95	..
Portage Rubber Co. com			54	56	..
Portage Rubber Co. pfd			92	94	..
Regal Motor Co. pfd			..	21	..
*Reo Motor Truck Co.			19½	21	..
*Reo Motor Car Co.			38½	40	..
Splitdorf Electric Co. pfd			..	..	..

No quotations available at this time on account of war.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Stewart-Warner Speed. Corp, com			76	78	+3
Stewart-Warner Speed. Corp. pfd			106	..	..
Studebaker Corp. com			161	163	+19
Studebaker Corp. pfd			110	111½	+1
Swinehart Tire & Rubber Co.			90	92	+3
Texas Company			165	167	—2
U. S. Rubber Co. com			53	54	..
U. S. Rubber Co. 1st pfd			105½	106½	—1½
Vacuum Oil Co.			215	220	—3
White Co. pfd			110	..	..
Willys-Overland Co. com			247	249	+16
Willys-Overland Co. pfd			108	109½	+ ½

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Chalmers Motor Co. com	..	97	162	167	—1
Chalmers Motor Co. pfd	94½	99	104	..	+1½
Continental Motor Co. com	155	180	320	..	—5
Continental Motor Co. pfd	..	75	87	..	+3½
General Motors Co. com	..	66	310	330	—25
General Motors Co. pfd	..	83½	114½	115	+1¾
Maxwell Motor Co. com	..	12¼	60	61½	+3¼
Maxwell Motor Co. 1st pfd	31	..	95½	98½	+1½
Maxwell Motor Co. 2d pfd	..	17	44½	52	+2¾
Packard Motor Car Co. com	..	..	142	150	+5
Packard Motor Car Co. pfd	90	..	100	..	..
Paige-Detroit Motor Car Co.	..	..	435	..	..
*Reo Motor Car Co.	20	..	38½	39⅜	+ ½
*Reo Motor Truck Co.	..	11¼	19¾	20½	+ ½
Studebaker Corp. com	..	..	158	162	+16
Studebaker Corp. pfd	..	..	105½	109½	..

INACTIVE STOCKS

*Atlas Drop Forge Co.	21	..	..	29	..
Ford Motor Co. of Canada	..	500	..	1500	—50
Kelsey Wheel Co.	..	..	205	..	..
*W. K. Prudden Co.	..	20½	21½	24	+ ½
Regal Motor Car Co. pfd	25	..	..	21	..

*Par value $10; all others $100 per share.

100,000 at St. Louis Car Show

25,000 of These Were Prospects and Dealers—Many Sales Reported

ST. LOUIS, MO., Oct. 14—The ninth annual automobile show of the St. Louis Automobile Manufacturers' & Dealers' Association came to an end on Oct. 9, the most successful in the history of the association.

Fully 100,000 persons saw at this show the first display of 1916 models west of the Mississippi River. Probably a fourth of that number were sub-dealers, farmers and other out-of-town prospects brought to the city by the Fall Festivities.

Tuesday, "Automobile Trade Day," was the most productive of sales. One of the biggest deals closed on this day was the sale by the Weber Implement & Auto Co. of a hearse and a squad of five sedans to an undertaker of Springfield, Ill. The new Chevrolet Co. of Missouri announced they had taken 272 orders for their Four-Ninety at the show. Several other distributors claimed they had obtained contracts for carload orders of their lines.

Joseph A. Schlecht, Allen, Jackson and Halladay distributor, treasurer of the Manufacturers' and Dealers' Association and chairman of the Show Committee—in short, commonly acknowledged as the "man who made the 1915 show"—said:

"We had a greater attendance than any year before. Sales were made every day by every dealer. Even the electric vehicle men sold more machines than at previous shows. The prime object of our association is to carry through the annual show. Though we do not aim to make money through admission fees, we no doubt did so at this year's show."

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Fletcher Cup Run Oct. 31

PHILADELPHIA, PA., Oct. 16—The annual fixture of the Automobile Club of Philadelphia, namely the Fletcher Cup Run, will be held on Sunday, Oct. 31. The run, which is a continuation of the Brazier Cup Run, established by the club in 1902, is open only to members of the club, and owners or members of their immediate family must do the driving.

The Fletcher Cup Run is a test of the ability of a driver to keep his car at varying speeds designated on a chart given at the start, showing the route and speed required over each section of the course. Any contestant fined for speed will be counted out. The route, which will not be announced until the start, will cover about 60 miles, with a stop for luncheon. Speedometer dials will be covered and sealed, thus compelling the driver to estimate his speed. For every minute behind or ahead of the proper elapsed time in passing various unannounced controls, the car will be penalized one point, the car with the least penalization being the winner. The Fletcher Cup becomes the property of the driver winning it three times, not necessarily in succession.

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Motor-Plowing Demonstration in Denmark

COPENHAGEN, DENMARK, Oct. 14—At the agricultural fair held at Vehle, Denmark, in July, a demonstration was given of three different motor plows—one manufactured in Denmark, one in Sweden, and one by the International Harvester Co. of America. These plows were of the smaller type, suitable for an average-sized farm. Two of the outfits were equipped with 16-hp. engines and one with a 12-hp. engine; their speeds ranged between 1 1-2 and 2 miles an hr. All were of the one-man type. When the necessary attachments are at hand the same tractors can be used for pulling binders. Two of them can be used for threshing purposes or other belt work without any change, while in order to do this with the Danish tractor an extended shaft with pulley is required.

At present there are in this country quite a few larger plowing outfits at work, and while these smaller outfits seemed to arouse considerable interest among the owners of averaged-sized farms, it is yet to be seen to what extent they can be sold.

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Jackson Trailers in Three Types

JACKSON, MICH., Oct. 12—The Jackson automobile trailer is the latest product of the Miles Mfg. Co. of this city. The trailers are made for use by any kind of automobile. There are three different types, each with several models.

Where delivery body is ordered 1⅛ in. rubber tires are furnished while on trailers with rack style body, models 31 and 33, 1⅜ in. tires are fitted. On model 41, 1¾ in. rubber tires are used. All models have a universal joint coupling. The standard color is Brewster green. The prices range from $22 to $98, f.o.b. Jackson.

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Automatic Traffic Signals for New York

NEW YORK CITY, Oct. 18—Automatic street signals for the control of traffic were in operation to-day at nearly all street corners where traffic policemen are stationed. The signals are a white standard with four arms, two of them red with the command Stop in white letters and two of them green with the order Go.

They are operated by the policeman on the corner who turns a handle which swings the signal and the letters are large enough to be read distinctly at a distance of 200 ft. The signals project over the street at a height to be read by all drivers.

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New Motor Bus Line in New York City

NEW YORK CITY, Oct. 15—The Board of Estimate, after three years of study, has recommended that a franchise be granted to the New York Motorbus Co., to operate double deck, side entrance cars over 31 miles of Manhattan streets, from Union Square on the south to Fort George on the north. The company offers a 10-cent fare for main lines, a 5-cent fare for crosstown and other short lines, and transfers which will keep the cost of a continuous trip within the 10-cent limit.

Howard Conklin, 1 Wall Street, is president of the company. Other directors are S. M. Conklin and H. B. Weaver, the company's consulting engineer. The company agrees to have 100 buses running within eight months.

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Armored Car Train for New York

NEW YORK CITY, Oct. 19—Governor Whitman of New York stated to-day that the State of New York soon will have an armored motor train. "This will be for service with the National Guard of the State," says Governor Whitman. "Certain public spirited citizens have interested themselves in the project by which the equipment is to be made available without cost to the State."

Other Governors, who already have interested themselves in the Automobile Reserve Corps are: P. L. Goldsborough of Maryland; E. L. Philipp of Wisconsin; George W. Hays of Arkansas; John B. Kendrick of Wyoming; Emmet D. Boyle of Nevada, and the Adjutant General writing for the Governor of Georgia.

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Arthur Klein Opens Garage

YOUNGSTOWN, OHIO, Oct. 14—Arthur Klein, the automobile driver, has given up racing and has opened a garage and service station in this city. The new concern is known as the Kleinart Motor Service Co., 637 Elm Street. Frank Lightner, who rode as a mechanician with Klein in a number of races, is associated with him in his new venture.

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Automobile Reserve for Maryland

BALTIMORE, MD., Oct. 16—Plans for the organization of a reserve automobile corps to serve as a branch of the Maryland National Guard are under way. The matter is being handled by Henry L. Rose, president of the Baltimore Automobile Club.

Factory Miscellany

Hess-Bright Adds—The Hess-Bright Manufacturing Co., Philadelphia, Pa., maker of ball bearings, has awarded the contract for the erection of a one-story 40 by 60 ft. addition to the hardening room at Front Street and Erie Avenue, at a cost of $3,980.

To Make Tires—The Hawkeye Tire Co., with a capital stock of $500,000, is being organized to manufacture a full line of standard size tires at a factory in Des Moines. Among the directors are E. G. Raffensperger, manager of the Des Moines Buick Co., and C. B. Hextell, a Des Moines attorney.

To Make Automobiles in Fort Madison—A new automobile company, to manufacture Champion cars, has acquired 7 acres of ground as a site for a factory at Fort Madison, Iowa. Bids for a two-story building, 100 by 200, the first factory unit, have been asked. Officers of the new company are identified also with the Perfection Tire & Rubber Co.

To Make Parts—S. W. Sorensen, formerly president and general manager of the Trio Mfg. Co., and J. B. Allen of the Olds Motor Co., have purchased the Brady-Nagel Mfg. Co. and will operate the same under the name of the S. A. Machine Co. They will manufacture automobile parts and specialties. The plant is equipped and is located at 518-520 Woodbridge Street, East.

Receives Drop Forging Order from Ford—The D. Wilcox Mfg. Co., Carlisle, Pa., has received a large order from the Ford Motor Car Co., for 580,000 pieces of drop forgings. The order amounts to many thousand of dollars and will keep the plant busy for the next 3 months at least. Additional men will be put on and other plans for an expansion are now in progress.

Nearly 31,000 Ford Employees—At the present time between 21,600 and 21,800 men are on the pay roll of the Detroit, Mich., plant of the Ford Motor Co. Of this number about 700 are employed exclusively in the general offices. At the assembling plants and service stations throughout the country there are now 9145 men employed, bringing the total force of Ford workers up to nearly 31,000.

Hartford Tire Pump Busy—The Hartford Tire Pump Co., Hartford, Wis., organized a year ago to manufacture compressors for application to motors, will immediately erect a new shop, which will also contain a complete garage and repair shop. The present quarters are in the Gehl Mfg. Co.'s works. The company is swamped with orders and intends to hasten construction work so that occupancy may be taken before midwinter. A complete welding and cutting apparatus will be installed in addition to considerable new power and manual tool equipment.

New Castle Tire Plant Busy—Much progress has been made by the New Castle Rubber Co. during the past several weeks since starting operations in the company's plant at Mahoningtown, just outside of New Castle, Pa. The plant is now running at nearly its full capacity. Additional men are being put on continually, and the orders booked will keep it running in full for some time. About 400 men are employed in the plant. The average output is between 250 and 300 tires daily.

Breeze Carbureter Adds—Work has been started on a two-story addition to the Breeze Carbureter Co. plant at 250-252 South Street, Newark, N. J. At present the manufacture of tubing by this concern is done in a one-story brick building having a frontage of 33 ft. on South Street, a depth of 120 ft. and a breadth which widens at the rear to 86 ft. In the rear of the present structure the reinforced concrete addition is being erected. The new quarters will give the plant 13,000 more sq. ft., making a total working space of 25,000 sq. ft. The addition will measure 80 by 80 ft.

Waukesha Motor Increasing Speed—The Waukesha Motor Co., Waukesha, Wis., manufacturing motors for passenger cars and trucks, is carrying out a new construction program which will afford much increased space for machine shop work in the present buildings and a new testing room and heat-treating department. Additions now under way include a new power and heating plant, 44 by 66 ft., and a new shop, 88 by 220 ft., for assembling and finished stock.

The Automobile Calendar

Oct. 16-23.....Pittsburgh, Pa., Show, Motor Square Garden, Automobile Dealers' Assn.
Oct. 18-24.....Troy, N. Y., Show, State Armory, Troy Automobile Dealers' Assn.
Oct. 18-25.....Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 20-22.....Excelsior Springs, Mo., National Assn. of Automobile Accessory Jobbers' Meeting.
Oct. 21.....New York City, Met. Sec. S. A. E. Meeting of Automobile Club of America.
Oct. 24.....Fort Worth, Texas, Race Meet.
Oct. 25-27.....Columbus, O., Garage Owners' Convention.
Oct. 29.....Indianapolis, Ind., Claypool Hotel, S. A. E. Meeting of Ind. Section.
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 2.....New York City, Sheepshead Bay Speedway, 100-Mile Race.
Nov. 12-20.....Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 18.....New York City, S. A. E. Met. Sec. Meeting.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.
Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 5-6.....New York City, S. A. E. Winter Session. Standards Committee Meeting.

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Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Philadelphia Auto. Trade Assn.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 14.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 29-Mar. 4....Fort Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
Feb. 15-20.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 19.....Newark, N. J., Show.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb.. Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

The Week in the Industry

Sheldon Hood Tire Mgr.—B. K. Sheldon has assumed the active management of the Quality Tire Co., 825 Main Street, Buffalo distributer for the Hood tire.

Logie Heads Toronto Chalmers—The Chalmers Motor Co. has opened a Canadian office at 18 Bloor Street, East, Toronto, with L. Logie as Canadian manager.

Manley Resigns—L. E. Manley has resigned as sales manager of the Adams-Oakland Co., Pittsburgh, Pa., and has assumed the duties of sales manager of the Wood-Oakland Sales Co., Cincinnati.

Marshall Buffalo McGraw Mgr.—G. J. Marshall has been appointed manager of the Buffalo, N. Y., office of the McGraw Tire & Rubber Co., East Palestine, Ohio. C. H. Connolly, former manager, goes to the Kansas City office.

Lindeman Firestone Western Ad Mgr.—C. B. Lindeman of the sales staff of the Seattle branch of the Firestone Tire & Rubber Co., has been elevated to the position of Western advertising manager. His headquarters will be in San Francisco.

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Dealer

New Boston Company—W. J. Stusick and E. L. Warner have formed the Winchester Motor Co. at Springfield, Mass., and they have taken the agencies for the Moline Knight and the Vixen with salesrooms and service station at 776½ State Street.

New Toledo Tire Co.—The Ohio Tire Service Co. is the name of a new concern which has been incorporated, and is located at 310 Ontario Street, Toledo. Joseph Love is president and Samuel Love is general manager. The concern is distributor for Ohio tires.

Spokane Buick to Move—The Northwest Buick Co. of Seattle and Spokane, has contracted for a new building in the heart of the automobile district in Spokane. The building will give a total of 11,600 sq. ft. of floorspace. The building will be in First Avenue, near Adams Street.

Five New Studebaker Branches—Five new Studebaker branch houses are now either being built or are about to be. Under construction at present are three new Studebaker branches, at Brooklyn, Long Island City and Kansas City. Building operations on two more are about to begin, at Dallas, Tex., and Portland, Ore.

Motor Men in New Roles

Merritt Now Sales Mgr.—S. W. Merritt, formerly with the Moreland Motor Truck Co., Los Angeles, in the capacity of factory superintendent of production, is now with Hughson & Merton as sales manager for the farm tractor department.

Krimmel G. & J. Tire Sales Mgr.—Andrew Krimmel, formerly assistant manager of the Republic Rubber Co.'s Philadelphia, Pa., branch, has been appointed sales manager of the Berrodin Rubber Co., 715 North Broad Street, distributor of G. & J. tires.

Blackley Promoted—B. C. Blackley, for some time manager of the truck department of the J. C. Tucker Co. that handled the Chase and Vim trucks in Rhode Island, has been made New England division manager for the Chase Motor Truck Co. of Syracuse, N. Y.

Barber Eastern Branch Mgr.—Z. C. Barber, who was wholesale manager of the Saxon Motor Co. in New York City, has been appointed eastern branch manager of the Detroit Weatherproof Body Co., and will open a salesroom in New York City. His present offices are 2202 Broadway.

Minto Gibney Pacific Coast Mgr.—The Gibney Tire and Rubber Co., Conshohocken, Pa., has appointed C. H. Minto as Pacific Coast manager for Gibney Tires, with headquarters at San Francisco. He will have complete charge of the far Western business. His headquarters will be a factory branch.

West Returns to Portland—Fred West, who for two years, 1913-14, was at the head of the J. W. Leavvitt Co., Portland, Ore., has returned to that field in charge of the Chevrolet line. Mr. West will have charge of all of the territory of Oregon, Washington and Idaho with the exception of the city of Seattle.

Day Heads Buffalo Packard—Promotions in the organization of the Packard Motor Car Co. of New York are announced by the company as follows: B. C. Day of the New York city headquarters has been appointed branch manager at Buffalo; T. P. Myers, also of the local headquarters, has been chosen manager of the truck sales department.

Pittsburgh Franklin Reorganized—Reorganization of the distributing agency of the Franklin company has been effected and the company known as the Franklin Motor Car Co. of Pittsburgh becomes the Franklin-Pittsburgh Automobile Co. The officers chosen for the new company are W. M. Carr, president; R. S. Suydam, treasurer, and A. R. Gribben, secretary and assistant treasurer.

Hyde Opens Indianapolis Office—Harlow Hyde, formerly advertising manager of the Empire Automobile Co., has opened an office in the Telephone Building, Indianapolis, Ind., and established an advertising and publicity bureau. Mr. Hyde has been identified with the advertising and selling end of the automobile trade for many years, at one time having been advertising manager of the Bosch Magneto Co.

Mitchell Now Enger Dealer—R. D. Mitchell, formerly selling representative for Gray & Davis products and later for Kelly-Springfield and Pennsylvania tires, has organized the Enger Motor Sales Co., of Wisconsin, to handle the State territory for the Enger Motor Car Co., Cincinnati, Ohio. E. A. Glab, also well known in the industry, is associated with Mr. Mitchell. Headquarters are being established in Milwaukee.

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Dealer

Newark Chalmers Moves—The service station and parts department of the Paddock-Zusi Motor Car Co., Newark, N. J., Chalmers dealer, has been moved to the company's new building at 894-896 Broad Street.

Hartford Co. Gives Free Service—The Auto Tire Co., 129 Allyn Street, Hartford, Conn., which does business also under the name of Jack The Tire Man, is exploiting its free service to tire customers. In order that the service may be broadened in scope a special service car has been commissioned. The plan now is to assist customers of the firm in tire trouble any distance from the store. The car will be on duty all the time.

Mason-Newark Velie Agent to Move—J. W. Mason, Velie and Briscoe agent in Newark, N. J., and at present located at 350 Halsey Street, will occupy a new building at 1005 Broad Street. The new building will be of the modern type of automobile sales and service station and will have a Broad Street frontage of 33 ft. and a depth on Kinney Street of 189 ft. The showroom, opening on Broad Street, will be 55 by 33 ft., finished in white tile with a mezzanine balcony. The second floor will be devoted to service.

Baltimore Trade Happenings—The Motor Car Accessory Co. has opened at 1201 North Charles Street, Baltimore. H. C. Clark and Frank Hoddinott are at the head of the firm. A general line of accessories, lubricating oils, etc., are being handled. The company also is distributor of the Newcastle tire.

A direct factory branch of the Firestone Tire & Rubber Co., Akron, will be opened in Baltimore next week. Temporary quarters will be established at 17 and 19 East Mount Royal Avenue, in a new addition which has been constructed to the quarters of the Zell Motor Car Co. building.

B. R. Leisure, who has been the manager of the Firestone branch at Salt Lake City is in Baltimore and will have charge of the local branch. His territory will include all of Maryland and large parts of Virginia and North Carolina.

Branches of the American Oil Co. of Baltimore are to be established in many Maryland towns. The American company, which refines and distributes Eze-Lube lubricating oil and which is one of the largest gasoline distributors in this section of the country, has established a branch at Cumberland, Md.

Recent Philadelphia Changes—About Jan. 1, 1916, the Republic Tire Co. will occupy a new four-story building now in course of construction at 806 North Broad Street, Philadelphia.

The Swinehart Tire and Rubber Co., at 320 North Broad Street, Philadelphia, will on Nov. 1 open its new and larger quarters at Broad Street and Fairmount Avenue.

Columbus Buick Adds—Oscar Lear, central Ohio agent for the Buick is making a number of changes at his salesrooms and garage at 286 East Long Street, Columbus. A 4800 sq. ft. service station has been built in the rear and a show-room has been added to the front.

Old Stutz Agency Bankrupt—The Stutz Motor Car Co. of Boston, Mass., that handled the Stutz until a month ago, has gone into bankruptcy with liabilities of $27,342.19 and $2,248.20 assets. The chief creditors are Edward M. Becker, $6,500, A. E. Chase, $6,500, and J. S. Bradstreet, $8,000, all of whom were identified with the company. There are about fifty unsecured creditors.

No More Gasoline Stands—Mayor James M. Curley of Boston, Mass., has just sent an order to the Street and the Park and Recreation Commissions of his city not to grant any more permits for sidewalk gasoline stands. He says in his letter that no such stands should be granted without a fee, and that as they are an obstruction to traffic care should be taken not to allow any more to be put up. Furthermore fees should be charged for those now in use as a rental at so much per year.

New Sparton Horn House Organ—Everybody's Business is the title of the new house organ of the Sparks-Withington Co., Jackson, Mich., manufacturer of the Sparton safety signals. The magazine is a monthly publication devoted to the better acquaintanceship between employees and employer. It will contain articles of every kind which will be both educational and humorous. William Sparks is the managing editor and G. C. Core the news editor.

Late Missouri Trade Items—The Fisk Rubber Co., St. Louis, Mo., has leased the southeast corner of Grand Avenue and University Street where it will improve the present building preparatory to increasing its stock of tires.

The Pierce Oil Corp. has virtually closed a deal for a large lot at the corner of Fourth and Monroe Streets, Hannibal, where it will erect a warehouse, tanks and filling station. This depot will act as distributing point for northeastern Missouri and probably the west central part of Illinois.

Bert A. Stephens, F. B. Stephens and A. B. Gauge have opened an automobile supply house at 432 St. Louis Street, Springfield. They will deal chiefly in tires.

The Kansas City Motor Sales Co., Kansas City, has been incorporated and has established office and salesrooms at 1711 Grand Avenue. The chief business of this company will be to sell Ford cars on deferred payments, and to make exchange of Ford cars in Kansas City and territory.

The Ford Automobile Co., Kansas City, which is doubling the size of its branch plant at Eleventh Street and Manchester Avenue in this city, will have the extension completed and ready for occupancy by Dec. 1.

Boston Co.'s in New Quarters—The Reo Motor Car Co., The Hupmobile Co. of New England and the Joseph S. Porter Co., agents for the Pathfinder and Regal cars, have all moved into the new building near the junction of Commonwealth Avenue and Beacon Street, adjoining the Marmon at Boston, Mass. The structure is divided into three sections, the Reo on the east, Pathfinder and Regal in the centre and Hupmobile on the west. Both the wholesale branch of the Hupmobile and the new retail agency will occupy the western section.

Willard's New Coast Quarters—The Willard Storage Battery Co. has opened quarters at 1433 Bush Street, San Francisco. Fourteen new service stations have been added by the company. This brings the total of Willard stations to 535. The most recent additions are: Conklin & Spindler, Chicago Heights, Ill.; Wells Garage, Wells, Minn.; Weber Battery Co., 1312 W. Jackson Blvd., Chicago, Ill.; Handy-Lewis Motor Car Co., Willmar, Minn.; Hackler Battery Co., Kaufman and Twenty-second Streets, Paris, Tex.; G. G. Gardner, Estherville, Neb.; Thorne Electric Co., 515-16 Center Avenue, Bay City, Mich.; C. E. Coogins, El Centro, Cal.; Woodward Tire & Repair Co., 1325-27 Woodward Avenue, Detroit, Mich.; C. P. Seeberg, 1918 Tuoulumne Street, Fresno, Cal.; Geo. H. Gant Electric Co., 320 S. Boots Street, Marion, Ind.; Herbert Hedges, Oxnard, Cal.; Slayton Power Co., Slayton, Minn., and Electric Garage Co., Third and Main Streets, Woodland, Cal.

Gemmer Co. to Build—Plans have been prepared for the construction of a two-story 40 by 60-ft. plant at Detroit, Mich., for the Gemmer Mfg. Co., manufacturer of automobile parts.

Rotary Motor Co. to Build—The Rotary Valveless Motor Co., Auburn, Wash., recently incorporated with $100,000 capital, by J. O. Menard and others, will build a factory for the manufacture of its specialty.

Recent Incorporations in the Automobile Field

Delaware

WILMINGTON—Standard Accessories Co.; $100,000; maker. Cloyd Marshall, 81 New Street, New York City.

District of Columbia

WASHINGTON—Livingston & Co.; $5,000. Leroy Livingston, J. L. Smith, W. N. Wood.

Illinois

CHICAGO—Good Care Garage Co.; $5,000. J. J. Purcell, J. Gumburger, E. S. Purcell.

CHICAGO—Sporub Tire Co.; $2,500. Jacob Levin, Davis Blumrosch, Lazarus Krinsky.

VANDALIA—Midland Accessories Manufacturing Co.; $150,000.

Indiana

AUBURN—Union Automobile Co.; $100,000. C. M. Brown, John Zimmerman, W. H. Schaab.

FRANKLIN—Continental Auto Parts Co.; $15,000; maker. J. H., S. C. and M. N. Staley.

LAPORTE—Indiana Mutual Automobile Insurance Co.; to do a mutual insurance business. F. C. Brewer, F. H. Henderson, F. J. Cook.

Kentucky

LEXINGTON—Taxicab Co.; $7,500. B. J. Mathews, Frest Hall, Annie Kendall, B. D. Berry.

Maryland

EMMITTSBURG—Emmittsburg Motor Car Co.; $10,000. E. E. Zimmerman, J. W. Wagerman, E. F. Ohler, D. F. Roddy.

Michigan

DETROIT—General Manufacturing Co.; $5,000; to manufacture and deal in automobile accessories, machinery, etc. C. W. Olson, C. R. Robertson, Henry Wild.

DETROIT—National Bronze & Aluminum Castings Co.; $10,000. P. J. Donnelly, V. R. Donnelly, R. L. Pratt.

FLINT—Monroe Motor Co.; $250,000 to $735,000.

MOUNT PLEASANT—Mount Pleasant Motor Co.; $5,000 to $15,000.

North Carolina

AYDEN—East-Over Corp.; $10,000; automobile dealer. J. R. Turnage, B. S. Sumerel.

North Dakota

HARVEY—Blanding Motor Co.; $10,000. C. H. Blanding, Adelaide A. Blanding, Millie L. Blanding.

New Jersey

MONTCLAIR—Brooks-Ostruk Co.; $5,000. Paul Ostruk, William H. Booth, Emerson Brooks.

New York

BUFFALO—Knoll Automobile Electric Service Co.; $5,000; electric equipment, automobiles. C. A. Hamlin, F. J. Rogan, J. G. W. Knoll.

New York City

Metropolitan Motor-Vim Agency; $50,000. W. C. Freeman, B. B. Stowe, C. Plock.
Utility Motor Trucking Co.; $200,000. J. M. Greene, E. M. Klein, Jennie Alex.

Ohio

CANAL DOVER—Dover Buick Co.; $5,000. H. C. Campbell, H. E. Haas, O. H. Weaver, E. G. Weaver, R. J. Weaver.
CLEVELAND—Auto Casting Co.; $10,000. W. R. Wildman.
CLEVELAND—Electric & Auto Parts Co.; $50,000. J. H. Ladwig, R. R. Bacheller, F. E. Lazare, G. W. Cowley, E. W. Slater.
CLEVELAND—Fred P. Brand Motor Co.; $30,000. F. P. Brand.
CLEVELAND—Cole-Cleveland Co.; $10,000. C. D. Simmons.
CLEVELAND—K-K Co.; $15,000; automobile dealer. F. W. Emslie.
CLEVELAND—The Keystone Oil & Supply Co.; $10,000. R. H. Lee, W. J. Patterson, G. M. Gallagher, E. M. Holmgren, S. D. Corbett.
CLEVELAND—The Motor Equipment Co.; $10,000; accessories. O. D. Summers, H. K. Summers, W. H. Everhart, M. Manshower, J. B. Moore.
CLEVELAND—The Ohio Electric Sales Co.; $10,000. O. K. Herron, W. A. Albaugh, Luther Day, R. E. Bixby, J. B. Kanner.
COLUMBUS—Shilling Safety Auto Bumper Co.; $100,000. F. W. Schriner, E. C. Shilling, Jacob Dagger, R. N. Ulrey, J. C. Erwin.
COLUMBUS—The Peters Sales Co.; $10,000; selling the Brinnon Ford starter. C. M. Peters, Albert Peake, G. A. Peters, J. B. McGaughy.
LLANO—Llano Motor Co.; $50,000; engine maker. M. D. Slator, M. M. Moss, E. G. Bogusch.

Pennsylvania

ERIE—Erie Trailer Mfg. Co.; $100,000; to make trailers for automobiles and trucks. H. A. Wilburn, C. C. Leon, F. J. Behrens.
UNIONTOWN—Gallatin Automobile Supply & Repair Co.; $5,000. W. H. Helmey, J. T. Hoover, C. H. Helmey, George Patterson.

South Carolina

COLUMBIA—New Zion Motor Co.; $3,000. W. C. Plowden, D. C. Shaw.
SUMMERTON—Summerton Motor Co.; $3,000. D. C. Shawk, H. A. Richbough.

Texas

CROSBYTON—Texas Auto Co.; $1,000. A. J. McKinnon, G. M. McGee, C. W. Murray.
WACO—Court House Garage and Supply Co.; $5,000. J. J. Richards, John McGlasson, J. E. Watson.

Virginia

ASHLAND—Hanover Garage and Repair Co.; $10,000. Boxley Vaughan, F. W. Tucker.
CLIFTON FORGE—Virginia Garage Co.; $30,000. B. H. Tatum, E. A. Snead, B. C. Goodman.

Washington

SPOKANE—Chalmers Auto Co.; $10,000. M. McInnis, O. E. Logan.
WALLA WALLA—Franklin Motor Co.; $75,000. R. H. Tuttle, Alex McKenzie, Inez Tuttle, Vivien Cookerly.

West Virginia

MORGANTOWN—Morgantown Jitney Co.; $3,000. F. M. Lucas, R. M. Davis, Fannie Davis, Hazel Lucas, Mabel Wilson.
WHEELING—Auto Accessories Co.; $5,000. P. F. Haberstick.

Wisconsin

LA CROSSE—Zimmer Motor Car Co.; $5,000. J. E. Zimmer, O. H. Matzke, Susan Zimmer.

Virginia

ROANOKE—Meadow-Price Co.; $1,000 to $50,000. D. S. Meadows, R. E. Price.

Automobile Agencies Recently Established

Alabama

Birmingham	King	Birmingham Motor Co.

Arkansas

Hope	King	C. C. Spragins
Paragould	Halladay	W. S. Coleman & Sons

California

Los Angeles	Enger	Irving Motor Car Co.
Los Angeles	Grant	Bekins-Speers Motor Co.
Los Angeles	Hollier	Stone-Dancy Motor Sales Co.
Los Angeles	Kelly-Springfield	Stone-Dancy Motor Sales Co.
Monrovia	Chevrolet	Foulke & Deatherage
Redlands	Chandler	Park Garage
Redland	Chevrolet	C. H. Clem
Redlands	Oakland	Park Garage

Colorado

Boulder	Metz	J. A. Outhier
Boulder	Stearns	F. Deckelman
Buena Vista	Haynes	W. C. Fletcher
Burlington	Metz	G. Danforth
Cheyenne Wells	Metz	D. R. Purdy
Colorado Springs	Haynes	E. D. Marr
Colorado Springs	Stearns	Ferguson & Ingersoll
Denver	Denby	A. C. Wagner
Denver	Paige	Platt-Fawcett Motor Co.
Fair Play	Apperson	H. Bergstrand
Flagler	Metz	Lewis Clark
Fort Collins	Inter-State	C. B. Mossman
Fort Collins	Metz	L. W. Van Dyke
Fort Morgan	Metz	J. M. Scofield
Greeley	Inter-State	C. C. Kersey
Greeley	Metz	F. P. Meeker
Haxtum	Metz	M. Anderson
Iliff	Metz	W. F. Alexander
Leadville	Haynes	Cloud City Garage
Longmont	Inter-State	Watts & Hylton
Longmont	Metz	F. Hildreth
Loveland	Inter-State	A. Straight
Mattison	Metz	K. Koontz
Ouray	Dodge	Silva Auto Co.
Pueblo	Metz	F. Hamilton
San Luis	Apperson	W. S. Parrish
Steamboat Springs	Dodge	J. A. Brobeck
Sterling	Inter-State	Ideal Auto & Mch. Co.
Trinidad	Metz	J. I. Glendenning
Vilas	Metz	C. F. Wheeler
Wray	Metz	McGinnis Bros.
Walsenberg	Metz	C. B. Blanton

Connecticut

Norwalk	Kissel	F. E. Lockwood & Co.

Georgia

Columbus	Apperson	B. Y. Hill Garage

Illinois

Abingdon	Maxwell	Reynolds & Fields
Alton	Haynes	C. G. Luft
Bloomington	Stearns-Knight	C. W. Frey
Champaign	Milburn Elec	R. C. Nelson
Chicago	Enger	Central Sales Co.
Chicago	Oldsmobile	P. Lorenzen
Colfax	Ford	F. M. Hager
Decatur	Mitchell	L. W. Cook
Freeport	Mitchell	M. L. Miller
Freeport	Vim	T. B. Rigney
Jacksonville	Haynes	W. C. Hamm
Jacksonville	Jeffery	Jacobs & Meyer
Manito	Oakland	Frank Wilson
Murphysboro	Oldsmobile	P. B. Outhouse & Co.
Pekin	Davis	H. A. Reuling & Son
Rockford	Paige	F. Carlson
Shirley	Reo	Charles Hutchinson
Springfield	Chevrolet	C. E. Knecht
Springfield	Oldsmobile	White Garage
Strawn	Dodge Bros.	Stottler Brothers
Weldon	Reo	M. H. Shinneman

Iowa

Anamosa	Kissel	Anamosa Auto Co.
Cedar Rapids	Vim	P. Perley
Des Moines	Kissel	Guarantee Motor Co.
Des Moines	Stearns	Hal Wells
Fonda	Kissel	Kenning Auto Co.
Waukon	Oldsmobile	J. G. Minert Auto Co.
Waterloo	Abbott-Detroit	G. W. Campbell Co.

Kentucky

Carrollton	King	Thomas Garage
Louisville	Scripps-Booth	Callahan Motors Co.

Maine

Greenville	Chandler	W. R. Dailey
Portland	Allen	Paterson Garage Co.

Maryland

Baltimore	Standard	Little Giant Sales Co.
New London	Apperson	J. R. Brandenberg

Massachusetts

Boston	Pullman	W. J. Hurley
Brockton	Flint	Loring Motor Car Co.
Brockton	Kissel	KisselKar Brockton Branch
North Adams	Oldsmobile	M. O. Haggerty
S. Deerfie d	Oldsmobile	T. J. Ahearn
Springfield	Haynes	Springfield-Haynes Co.
Worcester	Stearns-Knight	H. E. Plimpton
Worcester	Jackson	Greene Hale Co.
Worcester	King	H. B. Pulsifer

Michigan

Addison	Maxwell	Frank Barnaby
Adrian	Dodge	Wilcox Hardware Co.
Dowagiac	Ford	Scammon & Adams
Hartford	Regal	C. G. Warren & Son
Ionia	Dort	Benedict Buick Co.
Ionia	Oldsmobile	C. H. Welker
St. Johns	Jeffery	Steel & Valentine

Minnesota

Minneapolis	Herff-Brooks	Eagle Motor Works

Missouri

Centralia	Reo	L. & H. L. Roemer
Kansas City	Engel	Packard-Missouri Co.
St. Louis	Elco	Motor Car Repair & Supply Co.
St. Louis	King	Brinkman Motor Car Co.

Montana

Lewiston	Oldsmobile	J. W. Drake

Nebraska

Cozad	Oldsmobile	W. Robertson
Fremont	Apperson	Hall & Steele
Lincoln	Kissel	A. H. Meyers
Omaha	Enger	Foshier-Enger Co.
Omaha	Moline-Knight	R. G. Davis

New Mexico

Albuquerque	Metz	F. E. Dearth

New Jersey

Bradley Beach	King	E. S. Thomas
Matawan	King	J. C. Bushnell

New York

Buffalo	Inter-State	Blackburn Sales Co.
New York	King	Mineola Garage
Rochester	Enger	Heiber Motor Car Co.
Schenectady	Kissel	Wm. D. Havens
Shelter Island	King	G. B. Wells
Silver Creek	Oldsmobile	Wm. J. Dickerson
White Plains	Kissel	Kissel Kar Garage Co.

Oklahoma

Oklahoma City	Marion	Sutter-Johnson Motor Co.

Ohio

Alliance	King	J. F. Brannon
Bucyrus	Enger	F. J. Norton Sons
Portsmouth	Vim	R. S. Prichard
Rayland	Oldsmobile	W. D. Hoge
S. Charleston	Oldsmobile	Sullivan Auto Co.
Xenia	King	Page-Maxwell Sales Co.

Philadelphia

Addison	Enger	Straw & Dean
Germantown	King	Delmar Garage
Harrisburg	Studebaker	Ford Sales Co.
Hawley	Dodge Bros.	Gottlieb Matter & Sons
Hazletown	Enger	G. W. Wilmot
Lancaster	Enger	O. H. Shank
Monessen	Oldsmobile	H. N. Odbert
Parkers Landing	Apperson	Gibson & Sorgen
Philadelphia	Kissel	Baker-Price Co.
Reading	Vim	Reading Auto Co.

South Dakota

Sinai	King	F. H. Fo lberg

Tennessee

Memphis	Vim	G. W. Richardson

Texas

Fort Worth	Franklin	G. L. Omohundro
Houston	Apperson	Young & Dwire Co.
Marble Falls	Oldsmobile	Marble Falls Garage
Mesquite	Kissel	Humphreys & Vauston

Vermont

Burlington	Kissel	Todd & Tupper

Virginia

Big Stone Gap	Enger	Dominion Motor Car Co.

Washington

Spokane	Velie	Franklin Auto Sales Co.
Tacoma	Enger	W. E. Newton
Walla Walla	Hupmobile	Alvin Coyle

Wisconsin

Eagle	Oldsmobile	Smart Bros.
Hartford	Kissel	Schauer Brothers
Marion	Kissel	F. J. Hauge
Watertown	Oldsmobile	The Service Co.

Wyoming

Basin	Metz	G. R. Hoover & Co.
Dayton	Metz	R. W. Ratcliff